Exploring the Benefits and Limitations of Digital Vocabulary Learning Applications on Chinese Adult EAL Leaners in Automotive Industry: Implications for Business Communication Proficiency

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Abstract

This study investigates the benefits and limitations of mobile-assisted language learning (MALL) applications, specifically Quizlet, in enhancing business English vocabulary acquisition among Chinese adult EAL learners in the automotive industry. The research addresses the gap in existing literature regarding the comparative effectiveness of digital tools versus traditional paper-based methods for adult learners in professional contexts. By using a mixed-methods approach, the study involved 23 participants divided into a digital group using Quizlet and a traditional group using printed materials and audio files. Pre-tests, post-tests, and delayed post-tests were conducted to measure vocabulary memorization and retention, while semi-structured interviews provided qualitative insights into the participants' learning experiences.

Quantitative results indicated significant improvements in vocabulary acquisition for both groups over time, with no significant difference in effectiveness between the digital and traditional methods. The qualitative data revealed that Quizlet's interactive features, convenience, and visual and audio aids were beneficial for short-term memorization. However, some participants questioned the app's depth and impact on long-term retention. Traditional methods were valued for enabling note-taking and repeated practice, though digital tools were preferred for their flexibility and ease of use during fragmented schedules.

The study suggests that individual learning preferences, the convenience of mobile apps, and the specific features of learning tools significantly influence adult EAL learners' vocabulary acquisition in professional contexts. Recommendations for future research include addressing identified limitations such as small sample size, varying levels of English proficiency, and the short intervention period. Future studies should explore the integration of contextual learning, enhanced interactive features, and personalized feedback to optimize the effectiveness of digital vocabulary learning tools for adult EAL learners in professional settings.

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Definition of Key terms

Adult Learners: In this study, adult learners are individuals aged 18 and above with specific professional language learning needs.

EAL (English as an Additional Language): EAL refers to learners learning English in addition to their native language.

Quizlet: A digital learning tool that offers various features such as flashcards and games to help learners memorize and understand vocabulary and other study materials. In this study, Quizlet is used as a digital tool for vocabulary acquisition.

Digital Group: The group of participants in this study who used Quizlet as their primary method for learning business English vocabulary.

Traditional Group: The group of participants in the study who used traditional paper-based materials, including printed vocabulary lists, for learning business English vocabulary.

Memorization Rate: The rate at which participants are able to memorize business English words in this study, calculated by comparing the scores from the post-test to the pre-test. This metric indicates the immediate effectiveness of the learning method in helping participants remember new words.

Retention Rate: The rate at which participants retain business English words over a period of time in this study, calculated by comparing the scores from the delayed post-test to the pre-test. This metric assesses the long-term retention of vocabulary learned during the study.

M-Learning (Mobile Learning): Learning that occurs through the use of mobile devices, such as smartphones and tablets.

MALL (Mobile-Assisted Language Learning): A subset of mobile learning where mobile devices are used to assist the process of language learning in both formal and informal environments, providing a personal, interactive, and ubiquitous learning experience.

CALL (Computer-Assisted Language Learning): CALL refers to the use of computers and digital technologies to support language learning.

Chapter 1 Introduction

1.1 Background

The use of mobile phones now dominates all aspects of life including language learning (Sanosi, 2018). Mobile-assisted language learning (MALL) integrates Mobile Learning (M-Learning), the phenomenon that mobile devices are applied for learning purposes (Kukulska-Hulme, 2021), with language learning, enhancing learning experience in both formal and informal settings through handheld devices such as smartphones (Li et al., 2021). MALL is praised for bringing second language learning into real-world contexts, making the learning process personal, informal, interactive, and ubiquitous (Palalas, 2011).

Modern language learners benefit from interactive tools like customizable e-flashcards, engaging games, and collaborative activities, with Quizlet being a prominent example (Sanosi, 2018). Vocabulary improvement is recognized as a fundamental ability for effective communication (Dizon, 2024). Knowing and using vocabulary in various ways is essential for successful communication (Knight, 1994; Krashen, 1989). The multimodal capabilities provided by technology offer learners new ways to interact with language input, which are not possible with traditional paper-based media (Martinez & Schmitt, 2010).

In China, the demand for English language learning among adults is significant, driven by both professional needs such as obtaining better jobs or reading technical materials (Cortazzi & Jin, 1996; Wu et al., 2014) and personal interests (Wei et al., 2024). This demand is particularly strong in the automotive industry, which is highly international and involves extensive cross-border collaborations. According to Xinhua News (2024), in 2023, China's auto exports surged to 5.22 million units, marking a 57.4% increase year-on-year. Professionals in this sector must often use English for effective communication and international collaboration, making language skills crucial for career advancement (Hart-Rawung & Li, 2008). Notably, adult learners often have fragmented schedules and inflexible work hours, MALL applications offer a more convenient option for them to “learn anytime and anywhere” (Hu, 2011). These MALL tools enable learning during brief periods throughout the day, fitting into their busy lives more easily than traditional methods (Nisbet & Austin, 2013).

1.2 Significance of the study

A comprehensive review of vocabulary learning-designed MALL applications revealed their positive impact on EFL learners' vocabulary knowledge, motivation, attitudes, and perceptions (Alhuwaydi, 2022). However, there have been reports of inconsistent learning outcomes among some adult EAL learners during the transition to digital learning tools (Yang, 2020), and a meta-analysis of MALL studies between 1994 and 2012 found that most projects focusing on reading, listening, and speaking demonstrated positive outcomes, but some vocabulary-focused studies showed no significant differences (Burston, 2015a).

There is a noticeable gap in the literature about the effectiveness of digital tools like Quizlet particularly for adult EAL learners in professional settings. Existing studies often focus on younger learners without delving into the specific needs for professionals in the automotive industry. This research addresses the gap by examining whether mobile-assisted learning tools can enhance vocabulary acquisition more effectively than traditional methods for adult EAL learners and by identifying the benefits and limitations of these tools for vocabulary acquisition, memorization, and retention for adult EAL learners in automotive industry in China.

1.3 Purpose of the study

This study seeks to fill gaps in our understanding of how different learning tools influence vocabulary acquisition and retention for adult EAL learners with specific needs. The primary aim of this study is to evaluate the effectiveness of Quizlet in enhancing business English vocabulary acquisition among Chinese adult EAL learners in the automotive industry.

1.4 Methodology

This study employs a mixed-methods approach. Quantitatively, it involves pre-tests, post-tests, and delayed post-tests to measure vocabulary memorization and retention. The sample consists of 23 Chinese adult EAL learners working in the automotive industry, divided into digital (Quizlet) and traditional (paper-based) groups. Qualitatively, semi-structured interviews are conducted with selected five participants from both groups to gain deeper insights into their learning experiences and perceptions of the vocabulary learning tools used.

1.5 Research Hypotheses

This study is guided by the following hypotheses: The use of MALL tools such as Quizlet will enhance business English vocabulary acquisition more effectively than traditional paper-based methods for Chinese adult EAL learners in the automotive industry. Additionally, it is hypothesized that mobile-assisted vocabulary learning applications will result in a higher rate of vocabulary memorization compared to traditional paper-based materials among these learners. Furthermore, mobile-assisted vocabulary learning applications are expected to provide greater benefits in terms of vocabulary retention compared to traditional paper-based methods. These hypotheses aim to explore the comparative effectiveness of digital tools like Quizlet against traditional methods in enhancing vocabulary acquisition, memorization rate, and retention among adult EAL learners in the automotive industry.

In this study, Chapter 2 provides a comprehensive literature review on Chinese adult EAL learners' needs and challenges to learn business English, the opportunities and challenges of using MALL, Quizlet's effectiveness and limitations in vocabulary acquisition, and concludes with identifying the research gap and presenting the research questions. Chapter 3 details the research methodology, including design, participants, instruments, and data collection methods. Chapter 4 presents the data analysis and the result, comparing the data from the digital group with the data collected from the traditional group, along with qualitative insights from interviews. Chapter 5 concludes the findings, addresses research questions, discusses pedagogical implications, identifies limitations, and suggests future research directions.

Chapter 2 Literature Review

2.1 Learning Business English in automotive industry: Chinese adults leaners' growing needs and challenges

2.1.1 The needs of Chinese adult EAL learners in the automotive industry

In recent years, the demand for business English language learning among Chinese adults has been on the rise. Over 80% of the 50 participants in a mix-methods study by Wu et al. (2014) indicated that English is crucial for Chinese adults to remain competitive in the job market and serves as a significant tool to earn money. Chinese adults are increasingly motivated to learn Business English to secure better job prospects, higher salaries, and improved communication in global business settings (Li & Moreira, 2009). This growing demand is further driven by China's integration into the global economy, where English is the predominant foreign language and the common language of business (Lidi, 2008).

The automotive industry in China, which has developed rapidly since the 1990s, making China the world's fastest-growing automotive producer in recent years (Tang, 2009; Chen et al., 2020). With major foreign automakers such as Volkswagen, GM, Toyota, and Honda forming partnerships with Chinese companies, effective communication in English has become increasingly important in this globalized industry (Tang, 2009). As English is a business lingua franca that is used extensively in international trade (Rao, 2019; Yao & Du-Babcock, 2020), professionals in this field need to acquire business English vocabulary to engage effectively in meetings, understand technical documentation, and interact with international clients and partners (Barat & Talukder, 2023).

The importance of vocabulary in second language acquisition has been well-documented, with researchers emphasizing its role as the foundation for the four skills: speaking, listening, reading, and writing (Krashen, 1989; Sokmen, 1997; Laufer, 1999; Schmitt, 2000; Gu, 2003). For adults with professional needs in business English, vocabulary acquisition is a fundamental aspect that involves learning terms and phrases commonly used

in business environments, including understanding the meanings of words, pronunciation, and their usage in sentences and contexts (Miller, 1999). Understanding business terms related to functional areas such as production, research and development, sales, marketing, and human resources is essential for achieving effective communication in multinational companies and global markets (Coanca, 2023). Mastery of business English vocabulary enables professionals to participate confidently in meetings, negotiations, email correspondence, and presentations, thereby enhancing their professional efficacy (Rianita et al., 2022).

2.1.2 The challenges faced by adult learners

For adult learners, acquiring business English vocabulary can be challenging due to many factors. One of the primary difficulties is the limited time available for study due to family, work, and social commitments, which can lead to delays in learning or even dropping out (Romero, 2011; Sanga & Shirima, 2023). In addition, Long and Shaw's (2000) research on age differences in vocabulary acquisition revealed that older adults rely more on existing vocabulary knowledge than working memory to acquire new vocabulary due to their reduced working memory capacity. The reduced working memory may contribute to poorer vocabulary retention. Given these challenges, it is crucial to develop vocabulary acquisition methods tailored to adults that address these specific difficulties and enhance their vocabulary learning outcomes.

2.2 Using MALL: Opportunities and Challenges

MALL is a subset of M-Learning and CALL (Gangaiamaran & Pasupathi, 2017), which offers greater portability and mobility, social connectivity, context sensitivity, and individuality (Kukulska-Hulme, 2009). It helps address the challenges faced by adult learners, but also has its limitations.

2.2.1 Opportunities of using MALL

One of the primary advantages of MALL is its time flexibility, which is particularly valuable for adult learners who have busy schedules due to work, family, and social commitments as mentioned in 2.1.2 The challenges faced by adult learners. conducted a

comprehensive review examining the advantages and disadvantages of using MALL for students and professionals in learning English as L2. They focused on using MALL in learning vocabulary, listening, grammar, phonetics, and reading comprehension. The study highlighted the potential of MALL in providing a personalized, spontaneous, informal, and ubiquitous learning environment, making it an ideal solution for overcoming time and place barriers in language learning. MALL provides time flexibility that is particularly valuable for adult learners with busy schedules. MALL allow learners to access vocabulary materials anytime and anywhere, whether they are commuting, waiting in line, or taking a break (Sung, Chang, & Liu, 2016). This feature addresses the adults' need for flexibility in language learning, as adult learners often have fragmented schedules.

Moreover, MALL addresses the challenge of reduced working memory capacity by incorporating features that enhance memory retention. Lin and Lin (2019) conducted a systematic review of 33 quasi-experimental studies that involved participants learning L2 using MALL tools, aiming to examine the impact of MALL on L2 vocabulary retention. They compared the MALL methods to traditional methods such as paper-based learning approach, and compared different types of mobile learning modes. They found that MALL interventions generally improved vocabulary retention more effectively than traditional methods, with a significant effect size of 0.94. Additionally, spaced repetition, a technique supported by MALL apps, also allows learners to review vocabulary at strategic intervals, which reinforces memory retention over time (Metcalf & Rogers, 2010). Many researchers also discovered that mobile assisted language learning is effective in enhancing the retention of newly learned language through the use of ubiquitous learning approaches (Chinnery, 2006; Hwang & Tsai, 2011). Therefore, MALL method is especially beneficial for adult learners who may struggle with retaining new vocabulary due to diminished working memory.

In addition to time flexibility and enhanced memory retention, MALL offers other significant opportunities for adult learners. The interactive features of mobile-assisted language learning applications allow learners to progress at their own pace and adjust the level of

difficulty according to their language proficiency (Hung et al., 2012; Nisbet & Austin, 2013). This adaptability ensures that the learning experience is tailored to individual needs.

Furthermore, MALL provides contextual learning opportunities by presenting vocabulary in real-life scenarios (Uz Bilgin & Tokel, 2018), thereby making the learning process more relevant and practical for adult learners. Additionally, the integration of multimedia elements such as audio and video enhances learning by offering multiple forms of input, catering to different learning styles and preferences (Uther & Ipser, 2012).

2.2.2 Challenges of using MALL

While MALL offers many opportunities for vocabulary acquisition, it also faces several challenges, including issues of limited depth of learning, inconsistent engagement, assessment and feedback limitations, and lack of personalization.

One of the concerns with MALL is the emphasis on rote memorization over deeper cognitive processing, leading to superficial learning rather than long-term retention or practical language use. Guo (2022) conducted a study involving 102 third-year university students who are adult ESL learners in China, aiming to address the challenge of superficial learning associated with mobile learning by designing a five-step model to promote deep vocabulary acquisition. The study highlighted the challenge that while mobile learning is convenient, its fragmented nature often lead learners to learn only at a superficial level, making deep learning hard to achieve. Therefore, it is essential to develop a MALL tool that can facilitate the deep vocabulary acquisition, helping learners to attain more profound vocabulary knowledge.

Another significant challenge in MALL is the inconsistent engagement of learners. García Botero et al. (2019) examined the use of the Duolingo app among 118 higher education language students over a semester to explore the potential of MALL in fostering self-directed learning outside the classroom. The study used a mixed-methods approach, including tracking data from the Duolingo dashboard, questionnaires, and semi-structured interviews, to assess students' engagement with the application. The findings revealed a significant drop in engagement over time, largely due to a lack of sustained motivation and insufficient self-

monitoring and self-management skills among students. This highlights a key challenge in MALL, where the initial enthusiasm for using mobile apps often wanes, leading to inconsistent engagement and, potentially, lower learning outcomes.

MALL applications often provide automated feedback that may not be as accurate or nuanced as human feedback, making it difficult for learners to fully understand and correct their mistakes. Heil et al. (2016) conducted a review of 50 popular MALL apps, assessing their vocabulary teaching methods, grammar instruction, and corrective feedback. The study, which involved feedback from 200 language learners, found that most apps provided limited contextualized vocabulary instruction, lacked adaptation to individual learner needs, and lacked explanatory feedback. These limitations were seen as significant drawbacks for learners who depend on detailed feedback to improve their language skills. Similarly, Gafni et al. (2017) also criticized MALL applications like Duolingo for their lack of human feedback.

Although MALL offers some degree of customization, it might not fully adapt to individual learning needs and styles of each learner, which can affect its effectiveness in vocabulary acquisition. Petersen & Markiewicz (2008) introduced the PALLAS system, a framework designed to provide personalized and contextualized access to language learning resources through mobile devices. They argued that while mobile and ubiquitous learning offers flexibility for language learners to continue their studies outside the formal classroom, there remains a significant challenge in delivering appropriately personalized learning resources that adapt to the evolving context of the learner. However, their study focused on the theoretical framework and did not provide empirical evidence on the effectiveness of the PALLAS system in actual language learning scenarios.

2.3 The case of Quizlet

One of the famous MALL applications is Quizlet (Sanosi, 2018), which has around 50 million monthly users, 3 billion study sessions, and 350 million vocabulary sets (Quizlet, 2020). It includes functions such as Flashcards, Learn, Test, and Match, which are designed to facilitate vocabulary acquisition and retention. Quizlet is notable for its features that include

creating flashcards, supporting multiple languages, adding images, and offering various exercise types (Nakata, 2011; Waluyo & Bucol, 2021).

2.3.1 The effectiveness of using Quizlet for vocabulary acquisition

Quizlet has been widely recognized for its effectiveness in vocabulary acquisition. Multiple studies have demonstrated that Quizlet can significantly enhance vocabulary retention compared to traditional methods (Thi Thu Huong Ho & Satomi Kawaguchi, 2021; Avezova, 2022). Thi Thu Huong Ho and Satomi Kawaguchi (2021) conducted a quasi-experimental study involving 39 high school students in Vietnam to compare the efficacy of Quizlet with traditional paper flashcards (PFs) in improving EFL learners' receptive vocabulary acquisition. Over a four-week period, the students were divided into two groups, with one group using Quizlet and the other using PFs for two weeks before swapping tools for the following two weeks. The study used pre-tests, immediate post-tests, delayed post-tests, questionnaires, and audio-visual recordings to assess vocabulary gains and learners' perceptions. The study found that both methods were effective in improving vocabulary retention; however, Quizlet proved to be more effective than PFs. This finding was explained using Moreno's and Mayer's Cognitive-Affective Theory of Learning with Media, which suggests that the digital nature of Quizlet, combined with its multimedia features, creates a more engaging and effective learning environment. Similarly, Avezova (2022) conducted an experimental study with 42 low-level EFL learners at Prince Sattam Bin Abdulaziz University in Saudi Arabia to assess the impact of Quizlet on vocabulary acquisition for one month. Participants were divided into two groups and subjected to pre-tests and post-tests to measure vocabulary gains. The results showed a significant improvement in the vocabulary test scores of the experimental group that used Quizlet. In addition, Dizon (2024) examined the efficacy of using Quizlet to develop L2 English vocabulary among 9 Japanese university EFL students. The study employed a pretest-posttest design over 10 weeks, and participants were asked to learn Academic Word List (AWL) on Quizlet. The result showed significant gains in vocabulary acquisition, and a questionnaire

revealed that students had positive perceptions of Quizlet, finding it useful, easy to use, and expressing a desire to continue using it.

In addition, researches also showed that Quizlet is particularly effective in using e-flashcards to facilitate quick memorization. Quizlet's Flashcards function allows learners to create their own sets of flashcards or use sets created by others. This customization enables learners to focus on the vocabulary that is most relevant to their needs. Early researches reported several advantages of e-flashcards compared to traditional paper-based ones, including supporting both implicit and explicit vocabulary learning (Ellis, 1995), and promoting active and independent learning (García & Arias, 2000). Thi Thu Huong Ho & Satomi Kawaguchi (2021) found that when compared to traditional paper flashcards, Quizlet e-flashcards are more effective in improving EFL learners' receptive vocabulary acquisition. Similarly, Waluyo & Bucol (2021) conducted a research involving 65 low-level English proficiency university students in Thailand to evaluate the effectiveness of using Quizlet for vocabulary learning. The effectiveness of digital flashcards in Quizlet was evident in improving the students' vocabulary test scores before and after the Quizlet intervention. The study highlights that the use of digital flashcards like those in Quizlet can be an effective tool in enhancing vocabulary learning, especially when combined with a structured, gamified learning environment. Despite these positive findings, the focus on short-term memorization raises concerns about the depth of learning and the long-term retention of vocabulary acquired through Quizlet.

Moreover, Quizlet fosters student autonomy, motivation, and engagement, often outperforming traditional methods in vocabulary acquisition. Stroud (2014) investigated the impact of using Quizlet on vocabulary learning among 131 Japanese university students in English writing courses over 14 weeks. The study found that replacing traditional textbooks with Quizlet significantly increased students' behavioral, emotional, and cognitive engagement. Additionally, Sanosi (2018) conducted a study involving 42 low-level EFL learners at Prince Sattam Bin Abdulaziz University in Saudi Arabia to investigate Quizlet effect on vocabulary acquisition of L2 English learners. The participants were divided into two groups: an

experimental group using Quizlet and a control group without using Quizlet. Both groups underwent pretests and posttests, with the Quizlet group showing a significant improvement in vocabulary acquisition compared to the control group. The study highlighted that Quizlet provides an ideal environment that supports active learning both inside and outside classroom, promoting learners' autonomy, motivation and engagement by allowing learners to perform various learning tasks, assess their progress, and gamify the vocabulary learning process.

2.3.2 The challenges of Quizlet in vocabulary acquisition

While Quizlet has been widely acknowledged for its potential in enhancing vocabulary acquisition, several studies have highlighted challenges associated with its implementation and effectiveness.

One of the primary challenges with Quizlet is the variability in effectiveness across different study modes. Platzer (2020) conducted a study involving 165 first-year business students to assess the effectiveness of Quizlet for vocabulary learning. The study found that while Quizlet use significantly contributed to students' vocabulary acquisition, over a third of the students did not engage with the tool at all. Additionally, the effectiveness of Quizlet varies among its different study modes. The most frequently used study mode, Match, was less effective for vocabulary growth due to its reliance on recognition rather than recall. Notably, lower-proficiency students in the study overused the less effective Match, while higher-proficiency students favored the more beneficial recall tasks. While Platzer's (2020) study effectively identified the limitations of specific Quizlet modes, the study did not deeply explore the reasons behind or suggest strategies to improve the less effective modes.

In addition, another significant challenge is the issue of student engagement with Quizlet. Waluyo & Bucol's (2021) study investigated the impact of gamified vocabulary learning at home using Quizlet on students' vocabulary acquisition. Although the result showed significant improvement in students' vocabulary scores after using Quizlet, the study also highlighted the challenge of student engagement, as without teacher intervention, students,

particularly those with lower motivation and proficiency, may not explore or engage with the Quizlet sets.

Moreover, Quizlet also faces challenges in supporting productive vocabulary use and long-term retention. Senior (2022) conducted a study to explore the effectiveness of Quizlet in vocabulary acquisition within a basic-level ESL course, focusing on investigating the impact of Quizlet on receptive vocabulary retention, productive vocabulary use, and long-term vocabulary retention. The study found that while Quizlet significantly improved receptive vocabulary knowledge, it was less effective for productive vocabulary use and long-term retention. Although Quizlet is effective for quickly introducing vocabulary, it lacks the depth required for long-term retention and real-world usage.

2.4 Present study

2.4.1 Research gap

Despite the growing body of literature exploring the effectiveness of MALL in various educational contexts, several significant gaps remain. First, while many studies have demonstrated the benefits of MALL for vocabulary acquisition, the majority of these studies focus on general language learners or students in academic settings, with little attention paid to adult learners in specific professional industries, such as the automotive industry. Additionally, while mobile technologies have been shown to enhance vocabulary retention through ubiquitous learning, the specific impact of such tools on business English vocabulary acquisition for adult learners in a globalized industry has not been thoroughly investigated.

The present study seeks to address these gaps by examining the effectiveness of MALL applications, specifically Quizlet, in supporting vocabulary acquisition and retention among Chinese adult EAL learners working in the automotive industry, thus further exploring the benefits and limitations of MALL applications in assisting Chinese adult EAL learners to learn vocabulary. Through a mixed-methods approach, this research investigates not only the quantitative outcomes of vocabulary acquisition and retention but also the qualitative experiences of adult EAL learners using the MALL application, Quizlet. By focusing on adult

learners with specific professional needs, this study aims to provide insights into how MALL applications can be tailored to support language learning in specialized, industry-related environments. This research contributes to the existing body of knowledge by highlighting the applicability and effectiveness of MALL tools for adult learners in a vocational context, offering practical implications for language educators and industry trainers.

2.4.2 Research questions

1. Does the use of a mobile-assisted language learning tool such as Quizlet enhance business English vocabulary acquisition compared to traditional vocabulary learning method for Chinese adult EAL learners in the automotive industry?
2. Does the use of mobile-assisted vocabulary learning applications increase the rate of memorization compared to analog strategies?
3. What are the benefits and limitations of mobile-assisted vocabulary learning applications for retention?

Chapter 3 Methodology

3.1 Research Design

This study employed a mixed-methods design to assess the influence of MALL applications on adult learners' acquisition of automotive-industry specific vocabulary as part of learning business English and to explore the limitations of digital vocabulary learning applications. A mixed-methods research approach was used to benefit from the complete understanding of the research issue from both a qualitative and quantitative perspective as this will provide more insights than either approach does independently. Both forms of data, quantitative and qualitative are utilised in this study to provide a comprehensive analysis of the influence of using mobile-assisted learning applications on Chinese business EAL leanrers' vocabulary acquisition and the associated limitations of these learning tools.

Twenty-three EAL adult learners who currently work in the Chinese automotive industry were recruited. They were divided into two groups. The digital group with 11 participants used Quizlet as a learning tool to memorize new business vocabulary, and the traditional group with 12 participants employed a traditional method (printed vocabulary lists with English-Chinese definitions and audio files for learning the pronunciation). A word bank of 200 automotive industry related business words was compiled by the researcher with the selection of words from their work occasions (see Appendix B). The vocabulary selected for different work contexts in automotive industry was based on the responses collected from the participants' questionnaires, where they identified the contexts in which they often use English. A detailed explanation of the vocabulary selection process will be provided in 3.3 Research Instruments section of this chapter.

Before commencing the experiment, potential participants were required to complete a background questionnaire (see Appendix A) including their age range, positions in the company, frequency of using English at work, English usage occasion at work, English learning experience, self-reported English proficiency, self-assessment of self-discipline, and goals for learning English. Those who meet the inclusion criteria will proceed to the experiment stage.

Initially, both groups completed a pre-test with 50 multiple-choice and blank-filling questions designed by the researcher on Microsoft Forms to assess their proficiency in the word bank of 200 specific business English words commonly used in automotive industry. Next, a four-week intervention began. Learners in the digital group used Quizlet to study 200 new words within four weeks with a suggested pace of studying five days per week during their free time. Participants in the traditional group studied the same words using traditional paper-based materials and audio files following an identical timing schedule. After the intervention, both groups took a post-test with 50 multiple-choice and blank-filling questions designed by the researcher on Microsoft Forms to measure immediate vocabulary acquisition. A week later, a delayed post-test designed by the researcher conducted on Microsoft Forms assessed their vocabulary retention. The pre-, post-, and delayed post-tests have different sets of questions, all consisting of 50 questions in total, composed of 50 multiple-choice questions, which included 22 multiple choice questions assessing the understanding of word meanings, 8 multiple choice questions for vocabulary translation between English and Chinese, 11 fill-in-the-blank questions for vocabulary meanings translation, and 9 questions on parts of speech. These multiple-choice questions were developed by the researcher for the purpose of the study based on the Vocabulary Size Test (VST). The reason to choose the VST as a model for designing these questions is explained later in the text. Each question in the test is worth one point, comprising a total score of 50 points.

The vocabulary assessed in these tests was randomly selected from the 200-word bank specific to this research. The details of vocabulary selection, as well as the design of the pre-test, post-test, and delayed post-test, will be further elaborated in 3.3 Research Instruments section.

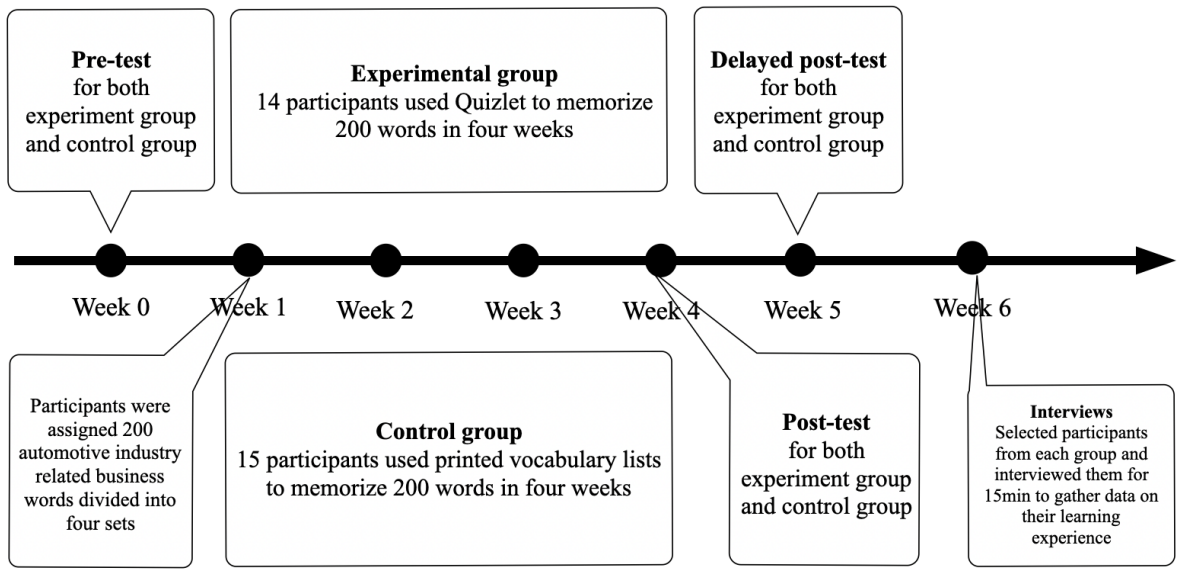
Test scores were collected, and then analysed using Statistical Package for the Social Science (SPSS) to compare the effectiveness of digital and traditional learning methods in vocabulary acquisition, memorization, and retention. As there were three sets of data: pre-test scores, post-test scores, and delayed post-test scores, a MANOVA of repeated measures test

was conducted to determine if there were statistically differences in the three vocabulary test scores across the three different times and if this pattern is different for the two groups.

Once the quantitative analysis was complete, this data helped inform the selection of participants for the qualitative semi-structured interviews. A selection of participants from each group, categorized by their performance on the tests, were interviewed for about 15 minutes in their native language (Chinese) to gather qualitative data on their learning experiences. These interviews were recorded as audio files using Microsoft Teams and transcribed for further analysis. The interviews aimed to capture the participants' experiences and perceptions of the learning tools to explore the benefits and limitations of using mobile-assisted learning tools and traditional printed material. Figure 1 below illustrates the research design.

Figure 1

Illustration of the research design



3.2 Research Participants

This study was conducted online. Participants in this study were recruited as 30 EAL adults learners in Chinese automotive industry. The number of participants was decided based on the experiment design which requires two groups of subjects. Fifteen to twenty is a common choice for an effective group size in linguistic research, and based on this, a total of approximately 30 subjects were recruited. At the conclusion of this study, seven participants

either did not commence or complete the process. The participants were all adult learners of English as an Additional Language in China, aged above 18, working in the automotive industry, and with a vested interest in business English. They needed to have a certain proficiency in English, pre-intermediate to intermediate level (self-reported by the participants in the questionnaire, see Appendix A), and have regular access to a mobile device compatible with the Quizlet app in case they were selected for that group. Anyone who failed to meet one or more requirements in the inclusion criteria was excluded.

Table 1 shows the distribution of participants by age, position in their companies, and self-assessment of English proficiency. The participants involved are all aged between 18 to 40 (n=23), with the largest proportion between 31 to 40 years old. The participants' roles vary within the automotive industry, mostly research and development engineers (n=8), followed by quality engineers (n=6), marketing engineers (n=3), strategic promotion engineers (n=3), project engineers (n=2), and IE engineer (n=1). These professionals reported using English frequently in their workplace, mainly for sending emails and communicating during project meetings, with a significant number also engaging in technical discussions and client interactions in English. Most participants self-reported their English proficiency at a pre-intermediate level (n=16), some self-reported at an intermediate level (n=6), with a few ranking themselves at a very basic level (n=1). Their recent English learning experiences varied, more than half participants having engaged in learning within the past six months, indicating a commitment to improving their language skills for professional development. Self-discipline in their learning journey was reported to be generally high, with almost half of the participants consistently completing tasks as planned. However, a significant number reported the need for external motivation to complete tasks. Notably, nearly all participants reported improving their business English is related to advancing their career prospects such as potential promotions or salary increases. This reflects the high value placed on English proficiency in the automotive industry and its influence on professional growth. Therefore, it indicates that the participants have enough motivation to follow the whole vocabulary learning session.

All the information was collected through a structured questionnaire, ensuring confidentiality and voluntary participation. It provided reliable insights into the participants' backgrounds, English usage in professional settings, and learning attitudes, which is crucial to this study.

Table 1

Participant Background Information

	Participants	**Age**	**Positions**	**Self-assessment of English proficiency**
Quizlet group	N=11	18~25 N=1 26~30 N=2 31~40 N=8	Marketing engineer N=0 Project engineer N=1 Research and development engineer N=4 IE engineer N=1 Strategic promotion engineers N=1 Quality engineer N=4	Very basic level N=0 Pre-intermediate N=8 Intermediate N=3
Traditional group	N=12	18~25 N=2 26~30 N=1 31~40 N=9	Marketing engineer N=3 Project engineer N=1	Very basic level N=1 Pre-intermediate N=8 Intermediate N=3

	Research and development engineer N=4 IE engineer N=0 Strategic promotion engineers N=2 Quality engineer N=2

3.3 Research Instruments

3.3.1 Vocabulary selection

The target vocabulary used to create the word bank had to be helpful for adults who work in automotive industry. Context-specific vocabulary used in the automotive industry were selected from existing training materials used by a Chinese automotive company with their permission.

In the initial background questionnaire, participants reported their English usage occasions at work in the automotive company, based on which, the researcher picked related business words. The word bank included the following automotive industry themed words: email communication, general business communication, meeting related, project management, technical terms for automotive industry, quality assurance, supply chain and logistics, manufacturing, sales and marketing, customer service, product specifications introduction, company introduction, common business English verbs, and commonly used adjectives in business English communication. As the words are all relevant to their work in the automotive industry, it was envisaged that participants would feel that it was useful to memorize the words and apply them in their daily work communication.

Milton and Meara (1995) used the Eurocentres Vocabulary Size Test (Meara & Jones, 1988) which showed that significant vocabulary growth can occur if the learning is done in the second language environment. In their study of 53 European people on a study aboard program,

the students of advanced proficiency achieved an average growth in vocabulary per person at a rate of almost 2500 words per year over the six months of the programme. This rate of growth is similar to the larger estimates of first language growth in adolescence. According to this, the average growth in vocabulary per person might approach a rate of around 200 per month. Therefore, the word bank was created with a list of 200 words. To answer the research questions (1) does the use of a mobile-assisted language learning tool such as Quizlet enhance business English vocabulary acquisition compared to traditional vocabulary learning method for Chinese adult EAL learners in the automotive industry; (2) does the use of mobile-assisted vocabulary learning applications increase the rate of memorization compared to analog strategies;(3) what are the benefits and limitations of mobile-assisted vocabulary learning applications for retention, the selected words were studied in two different ways. The traditional group studies target vocabulary based on paper-based vocabulary list and audio. The digital group studied the vocabulary in the word bank through the Quizlet application.

3.3.2 Pre-test, post-test and delayed post-test design

The pre-test was given to participants before the vocabulary memorization process starts. Then, the post-test was given after the four-week vocabulary memorization process. Finally, the delayed post-test was given one week after the post-test. These three tests measured the students vocabulary knowledge prior to and after the study, as well as measure the students vocabulary retention rate. The tests involved 39 multiple choice questions and 11 blank-filling questions, encompassing questions about word meaning, part of speech, synonyms, and antonym. The pre-, post-, and delayed post- tests had different questions, yet the patterns of the questions were maintained for ensuring that vocabulary knowledge that they just learned throughout the study were assessed. The sample pre-, post-, and delayed post-test questions can be seen in Appendix C.

For designing the pre-, post-, and delayed post-tests, several vocabulary tests were evaluated—LexTALE, Lex-30, Vocabulary Size Test, Word Associates Test, and Yes-No Test (Meara & Buxton, 1987; Read, 1993; Meara & Fitzpatrick, 2000; Lemhöfer & Broersma, 2012). The LexTALE is a yes or no vocabular test aimed at advanced English learners, comprising 60

items (40 real words and 20 nonwords) designed to provide a quick measurement or prediction of participants' English vocabulary knowledge. It is useful in distinguishing between different levels of language proficiency among participants in experiments, which is crucial for controlling the proficiency level (Lemhöfer & Broersma, 2012). Similarly, the Yes-No test requires participants to identify if they know each word presented to them including real words and nonwords. It can also quickly assess large numbers of words, ideal for preliminary screenings (Meara & Buxton, 1987). Although the two tests are efficient in assessing vocabulary knowledge, they may not adequately capture the depth of vocabulary knowledge which will in turn limit their effectiveness in cases requiring a deep understanding of word use. In addition, the result might not be reliable and valid enough, as they encourage learners to guess due to its binary nature (yes or no).

The Lex-30 test, using free word association format, requires participants to respond to 30 stimulus words to assess both breadth and depth of their vocabulary knowledge. The words used as stimuli are high frequency words to ensure even low-level learners can recognize them, and they generate responses that are not common words (Meara & Fitzpatrick, 2000). The Word Associates Test presents participants with target words and several associates and distractor words, assessing their ability to recognize word relationships such as synonyms and collocations. It focuses on the depth of vocabulary knowledge and is considered a robust diagnostic tool (Read, 1993). While the two tests explore the depth and breadth of vocabulary knowledge, they have limitations due to their subjectivity and complexity. In Lex-30, the scoring is subjective as the format of the test is open-ended. The interpretations of valid associates vary greatly. The WAT can be challenging for participants due to its complexity. The test requires participants to distinguish between nuanced and subtle semantic relationships which might lead to lower performance.

Among all the vocabulary tests assessed, the Vocabulary Size Test is the most valid and reliable for the purpose of this research, therefore it was selected to design the pre-, post-, and delayed post-tests. The VST requires participants to choose multiple choice questions across 14 frequency levels in order to estimate learners' total vocabulary size. In each question,

sample sentences are provided, containing the target words tested, and the correct option is the synonym of the tested word. This test considers not just if a word is known but also the degree to which it is known, therefore, it is known for its comprehensive evaluation of learners' vocabulary across different frequency levels (Nation & Beglar, 2007). The test design allows for a precise measurement of vocabulary acquisition and retention, essential for assessing if participants acquire the automotive industry related business English words. In addition, the VST includes multiple choice questions which reduce guessing, ensuring a more accurate assessment of participants' true vocabulary knowledge. The high level of reliability and validity is essential in this research in order to draw meaning conclusions through the three tests. In designing the multiple choice questions in the three tests, the option "I don't know" was also included in each question in order to avoid guessing if participants do not know the word, thus making data precise enough. The sample pre-, post-, and delayed post-tests questions can be seen in Table 2.

Table 2

Sample pre-, post-, and delayed post-test questions.

Pre-test	**Post-test**	**Delayed post-test**
INQUIRY: They opened an inquiry into the missing shipment.	**Partnership** : Our company has a partnership with a firm overseas.	**Align:** We need to ensure our goals align with the client's expectations.
a) Bill	a) Friendships	a) Match
b) Question	b) Cooperation	b) Expand
c) Order	c) Conflict	c) Reduce
d) Box	d) Groups	d) Delay
e) I don't know	e) I don't know	e) I don't know

QUOTATION: We received a competitive quotation for the bulk order.

a) Paper
b) List
c) Price
d) Stamp
e) I don't know

Refer to the example sentence, and select the correct part of speech for the following vocabulary.
Example sentence：
Our **logistics** team takes care of shipping the products.

Logistics:

a) noun 名词
b) verb 动词
c) adverb 副词
d) adjective 形容词
e) pronoun 代词
f) I don't know

Strategy: The company's **strategy** was focused on customer

Benchmark: We aim to set a new benchmark in quality.

a) Middle
b) Start
c) End
d) Standard
e) I don't know

Refer to the example sentence, and select the correct part of speech for the following vocabulary.
Example sentence：The automotive sales **exceeded** projections due to high demand for electric vehicles.

Exceed:

a) noun 名词
b) verb 动词
c) adverb 副词
d) adjective 形容词
e) pronoun 代词
f) I don't know

Refine: The engineering team worked tirelessly to **refine** the design of the

Research: Our team is researching new ways to reduce emissions from car engines.

a) Ignore
b) Investigate
c) Reduce
d) Copy
e) I don't know

Refer to the example sentence, and select the correct part of speech for the following vocabulary.
Example sentence： The company must **adhere** to strict quality standards in car manufacturing.

Adhere:

a) noun 名词
b) verb 动词
c) adverb 副词
d) adjective 形容词
e) pronoun 代词
f) I don't know

Encourage:

To **encourage** innovation,

satisfaction. (Write the Chinese meanings of the bolded words.)	product. (Write the Chinese meanings of the bolded words.)	the car manufacturer awards grants to engineers for developing eco-friendly technologies. (Write the Chinese meanings of the bolded words.)

3.3.3 Quizlet

Quizlet, created in 2005, is a widely used educational tool for vocabulary learning. It reports to have millions of users using its website and mobile application (Robertson, 2015). The Quizlet platform includes several learning functions: learning, short answer writing, word flashcards, dictation, testing, matching cards, and gravity. The website version has more functions when creating vocabulary lists for study, such as providing suggested images for word meanings. Learners can also get access to different learning modes such as flashcards, games, collaborative activities, and quizzes to help them reinforce their learning. These modes facilitate rote learning, facilitating vocabulary memorization and retention (Platzer, 2020; Khuong et al., 2021). Once the instructor creates new vocabulary lists on Quizlet using the website, the participants can be added to the vocabulary set to learn the words through different learning modes on the mobile application. The learning functions except dictation and gravity are used in the same way as the website in the mobile application. Table 3 below shows the learning functions of Quizlet.

Table 3

Quizlet's Learning Functions and Descriptions

Learning Functions	**Description**	**On website**	**Mobile app**

Learn	Students can learn words and their meaning through multiplechoice and writing questions. Questions grades from easy to difficult.	Available	Available
Flashcards	Digital flashcards demonstrate terms and can be flipped by mouse clicks or tabs on screens to show definitions or pictures explaining the term.	Available	Available
Write	Students are asked to write the definitions for the terms or the pictures exposed. Extra attempts are required if the learner makes an error.	Available	Available
Spell	Students listen to audio prompts and are asked to type what they hear. If they misspell the word, they will hear it dictated letter by letter while the correct answer is being typed in the screen.	Available	Not available
Test	A test of four types of questions: written, multiple choice, matching, and True or False. The questions are based on the study set whether the terms are explained by picture, definition, or L1 translations. Students can check their scores and the correct answers for the mistaken ones.	Available	Available
Match	A game in which learners are asked to match terms to their definitions (or the	Available	Available

	corresponding pictures) as quickly as possible. Each time a learner finished, the app shows him his score and rank among other learners.		
Gravity	Another game in which the terms appear on asteroids approaching the planet. Learners are asked to type the corresponding definition of the term before the falling asteroid crashes onto the planet.	Available	Not available
Live	This in-class collaborative activity requires 4 or more learners connected to http://quizlet.com/live and they are asked to enter the unique session code. The learners are distributed to groups each of which answers multiple choice questions based on the study sets via their mobile devices. The answers are randomly scattered among the devices, therefore, a collaboration is required to decide the correct answer. The first group to finish the game wins.	Available	Not available

In this study, four Quizlet vocabulary sets were created after vocabulary selection (see Figure 2). Each list comprised of 50 words grouped by themes with their English-Chinese translations, part-of-speech tags, and Quizlet-suggested images to facilitate vocabulary

learning (see Appendix B). The 200 selected words were put into four lists with themed categories, such as email communication, general business communication, meeting-related terms, project management, and technical terms specific to the automotive industry. Each participant was asked to memorize one list per week over a four-week period. The thematic words included different areas in automotive industry such as quality assurance, logistics, manufacturing, sales and marketing, customer service, etc. In addition, the Quizlet platform provides analytic features that allow the researcher to check each participant's progress on vocabulary lists and observe which specific learning functions were used. From the first week of vocabulary memorization, participants in the experimental group were encouraged to use six learning functions in the Quizlet application which include Learn, Flashcards, Write, Spell (listen to pronunciation), Test, and Match. Data were collected by the end of the four-week vocabulary memorization. According to the collected data, in the first week, 84.62% of participants used "Learn" function, which decreased gradually each week to 46.15% by week 4. The "Flashcards" function had 100% usage in the first week, decreasing to 76.92% by the end of the last week. The "Write" function had 23.08% usage in the first week, but had no participants using it from the second week onwards. The "Spell" function was not used by any participant during the study period. The "Test" function had a high usage rate at 76.92% in the first, however, it decreased and ended with 53.85% in the last week. The "Match" function saw a decline from an initial 61.54% to 46.15% by the end (see Table 4). Apparently, "Flashcards" and "Test" were most consistently used across four weeks, indicating learners' preference for the specific study modes. According to Nation (2001), using flashcards is a time-honored, effective, and efficient vocabulary learning strategy (Nation, 2001). The benefits of web-based flashcard programs may even outweigh paper-based ones (Hoang, 2015).

Table 4

Participants' Usage of Six Quizlet Functions Observed from the Backend

Functions	Numbers/ Percentage	Weeks			
		1	2	3	4
Learn	Participant number	11/13	10/13	8/13	6/13
	Percentage	84.62%	76.92%	61.54%	46.15%
Flashcards	Participant number	13/13	11/13	11/13	10/13
	Percentage	100.00%	84.62%	84.62%	76.92%
Write	Participant number	3/13	0	0	0
	Percentage	23.08%	0	0	0
Spell	Participant number	0	0	0	0
	Percentage	0	0	0	0
Test	Participant number	10/13	8/13	8/13	7/13

	Percentage	76.92%	61.54%	61.54%	53.85%
Match	Participant number	8/13	6/13	7/13	6/13
	Percentage	61.54%	46.15%	53.85%	46.15%

3.3.4 Paper-based materials

The traditional group employed paper-based materials to memorize vocabulary, using the exact same content as the Quizlet group to ensure consistency in the comparison. The paper material included a word bank with the same 200 business English words related to the automotive industry with English words, Chinese definitions, parts of speech, and the matched pictures same as those used on Quizlet were provided for each word. As the Quizlet platform provides Spell function which allows participants to listen to the pronunciation of each word, audio files were provided for the traditional group, compensating for the lack of the pronunciation feature available on Quizlet. The set of paper-based materials, along with the audio files, was distributed to the participants of the control group, enabling them to engage with the study material tangibly.

3.3.5 Interview

In this study, participants were selected and asked for a structured interview at the end of the study term (four weeks). It took around 15 minutes. The interviews were conducted online and were audio-recorded using Microsoft Teams. The researcher asked for participant consent prior to the interview. The questions in the interview were not provided to the participants beforehand as the researcher sought to secure open and transparent responses from the participants. To frame the semi-structured interviews, nine questions were prepared and they are shown below:

1. What challenges did you face while using the learning method assigned to you?
2. Were there any aspects of the learning method that you found particularly limiting or ineffective?
3. (For the digital group) Which features of Quizlet did you find most beneficial for your learning? Were there any features that were less helpful or even hindering your

progress?

4. (For the traditional group) How effective did you find the traditional methods (printed vocabulary lists and audio files) for learning vocabulary? Were there aspects that could be improved?

5. Can you describe your overall experience with the vocabulary learning method used? What did you like or dislike about it?

6. Reflecting on your learning journey, what would you suggest to improve the effectiveness of the method used?

7. Did seeing your scores improve or not improve affect your enthusiasm or dedication to the learning process? In what way?

8. Throughout the study, what motivated you to continue using the vocabulary learning method? Were there any external or internal factors that significantly influenced your motivation?

9. Can you identify any specific moments that particularly increased or decreased your motivation?

3.3.6. Data Collection Methods

3.3.6.1 Consent form

A non-skippable page was displayed at the beginning of the online experiment to state the purpose of the study, the information that will be collected, the reason for information collection, the management of the collected data, their right to withdraw in keeping with the requirements of ethics approval. All participants were required to read the information and provide their consent to proceed. The information was also available in Chinese on participants' request.

3.3.6.2 Questionnaire

A background questionnaire on Microsoft Forms was distributed to the participants to gather their information, including age range, job positions, frequency and context of English usage at work, last English learning experience, self-rated English proficiency, learning discipline, and the perceived impact of English skill on career development (see Appendix A).

This questionnaire is critical in establishing participants' profile, and ensure they met the inclusion criteria for the subsequent experimental stages of the study. All the responses were collected confidentially and stored securely in keeping with University protocols.

3.3.6.3 Pre-test, Post-test, and Delayed Post-test

To evaluate the participants' vocabulary proficiency and the effectiveness of the learning methods employed, three types of assessments were assigned to the participants: a pre-test, a post-test, and a delayed post-test. Each assessment consisted of 50 multiple-choice and blank-filling questions delivered via Microsoft Forms, targeting the word bank of 200 specific business English words they learned from the vocabulary lists created. These assessments were given to the participants at different times in the study: the pre-test was conducted before the study intervention, the post-test immediately following the four-week learning period, and the delayed post-test one week later to measure vocabulary retention over time. All the test results were collected through Microsoft Forms and saved in Oxford University OneDrive as required.

3.3.6.4 Interview

Following the quantitative analysis, semi-structured interviews were conducted with selected participants from each group. Participants were chosen based on their performance in the three tests. Each interview lasted about 15 minutes and was conducted in the participants' native language, Chinese, to encourage detailed responses. These interviews aimed to harvest in-depth insights into the participants' experiences, perceptions, and the subjective effectiveness of the digital and traditional learning tools used. All interviews were recorded as audio files and transcribed for further thorough analysis.

All data were de-identified by replacing the participants' names with a series of participant numbers in data processing stage. A look-up chart which matches participants' names with the participant numbers was kept securely and protected with a different password in the University's online storage service separately and can only be accessed in necessary situations (e.g. a follow-up interview to participants whose task result is particularly intriguing and worth a deeper investigation). The look-up chart will be permanently destroyed when it is

no longer needed. Task results, consent records, contact details, audio recordings, and transcript of audio recordings were stored securely in the University's Nexus365 OneDrive for Business online storage service with password protection and multi- factor authentication.

Chapter 4 Data Analysis

4.1 Introduction

This chapter introduces the results of data analysis. Results from a pre-test, post-test, and delayed post-test of 23 participants were analysed using SPSS. The semi-structured interviews of five participants of the study were interpreted. This study consists of mixed-method design. In this approach, qualitative data were collected after collecting quantitative data and were used to help explain the quantitative results.

4.2 Quantitative Data Analysis

4.2.1 Test Results

In the quantitative part of this study, the targeted participants included 23 EAL adult learners who currently work in automotive industry in China. Acquaintance network and snowball sampling were used to recruit participants. The researcher had acquaintance who works in automotive industry in China who helped the researcher to find suitable subjects by referring their acquaintance. The researcher contacted all the subjects, explained the research design, and invited them for participating in the study. All the participants were required to read the information about the study and they were asked if they were willing to give their consent. Through the participant recruitment process, 30 participants who met the inclusion criteria were chosen, however, seven participants dropped during the process. In the end, the valid number of participants was 23. Eleven participants were randomly selected to be the members of digital group (using Quizlet as a learning tool to memorize business vocabulary), while twelve participants were also randomly assigned to the traditional group (using printed vocabulary lists for memorizing the same business vocabulary as digital group).

A MANOVA of repeated measures test was conducted to evaluate the null hypothesis that the use of the digital tool Quizlet does not enhance business English vocabulary acquisition more than traditional learning methods among Chinese adult EAL learners in the automotive industry; and digital vocabulary learning applications do not increase the rate of memorization compared to traditional learning method among Chinese adult EAL learners in automotive industry. The result of MANOVA indicated there was no significant interaction between the

type of learning method (digital vs. traditional) and time, suggesting that changes in vocabulary acquisition over time did not differ significantly between the digital and traditional groups. It implies both digital and traditional methods are equally effective in enhancing vocabulary learning over time. Detailed analysis are shown below.

Figure 3

Profile plots of the MANOVA of repeated measures test

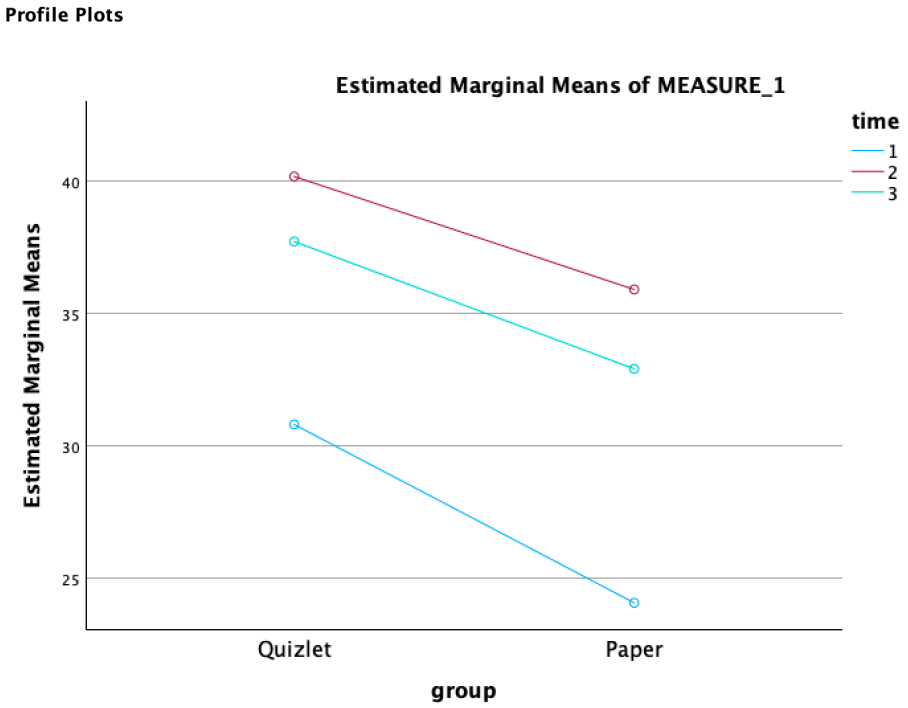


Table 5

Descriptive Statistics of Pre-test, Post-test, Delayed post-test scores for both digital and traditional groups

	Group	*Mean*	*Std. Deviation*	*N*
Pre-test	Digital	30.82	11.583	11
	Traditional	24.08	8.350	12
	Total	27.30	10.377	23

Post-test	Digital	40.18	4.813	11
	Traditional	35.92	7.379	12
	Total	37.96	6.519	23
Delayed	Digital	37.73	5.424	11
post-test	Traditional	32.92	8.240	12
	Total	35.22	7.305	23

Table 5 reveals the descriptive statistics for the pre-test, post-test, and delayed post-test for both digital group and traditional group. The pre-test scores showed that the mean score for the digital group was M=30.82, with a standard deviation of SD=11.583. The mean score for the traditional group was M=24.08, with a standard deviation of SD=8.350. The mean difference between the groups at this stage was 6.74, indicating that digital group had higher starting point than traditional group. For the post-test results, the digital group's post-test mean increased to M=40.18 (SD=4.813), showing significant vocabulary acquisition. The traditional group's mean pos-test score increased to M=35.92 (SD=7.379), also showing significant improvement. The mean difference between the groups in the post-test was 4.26. For the delayed post-test, the digital group maintained a higher mean score of M=37.73 (SD=5.424) compared to the traditional group's M=32.92 (SD=8.240), with a mean difference of 4.81.

Table 6

Result of Box's Test of Equality of Covariance Matrices

Box's M	5.809
F	.816
df1	6
df2	3119.084
Sig.	.557

In the preliminary analysis, Box's Test of Equality of Covariance Matrices was conducted to ensure that the variance covariance structures across the digital and traditional groups were homogeneous. Table 6 shows that p-value=0.557, indicating no significant differences in the covariance matrices across groups ($p > 0.05$), ensuring that any effect detected by MANOVA is not due to differences in the variance-covariance structure among the groups. Therefore, it is appropriate to proceed with the MANOVA under the assumption of homogeneity of covariance matrices.

Table 7

*Results of Multivariate Tests of time and time*group*

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
time	Pillai's Trace	.632	17.168[b]	2.000	20.000	<.001	.632
	Wilks' Lambda	.368	17.168[b]	2.000	20.000	<.001	.632
	Hotelling's Trace	1.717	17.168[b]	2.000	20.000	<.001	.632
	Roy's Largest Root	1.717	17.168[b]	2.000	20.000	<.001	.632
time * group	Pillai's Trace	.021	.210[b]	2.000	20.000	.812	.021
	Wilks' Lambda	.979	.210[b]	2.000	20.000	.812	.021
	Hotelling's Trace	.021	.210[b]	2.000	20.000	.812	.021

Roy's Largest Root	.021	.210[b]	2.000	20.000	.812	.021
Pillai's Trace	.632	17.168[b]	2.000	20.000	<.001	.632

The multivariate analysis was conducted to evaluate the effects of time and the interaction between time and group on vocabulary acquisition and retention (see Table 7). It showed highly significant effects of time on the dependent variables (Pillai's Trace = .632, Wilks' Lambda = .368, Hotelling's Trace = 1.717, Roy's Largest Root = 1.717, all with $p < .001$). The Partial Eta Squared of .632 suggests that a considerable proportion of the variance in vocabulary proficiency can be attributed to the time. The multivariate tests also assessed the interaction effects between time and group. However, there was no significant interaction effects ($p = 0.812$), indicating both digital and traditional methods are equally effective over time in terms of vocabulary acquisition for Chinese EAL adult learners in automotive industry. The results show that while time significantly affects vocabulary acquisition, the type of learning methods used (digital vs. traditional) does not differentially impact the rate of vocabulary memorization and retention over time.

Given the significant influence of time and the non-differential effects by group, the qualitative interviews were conducted after collecting the quantitative data to explore more nuanced aspects of both learning tools' effectiveness, such as user learning experience, engagement levels, specific features that may enhance learning, the role of personalization in learning outcomes, scoring impact and motivation impact.

Table 8

Results of tests of within-subjects effects

	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
time	Sphericity Assumed	1390.567	2	695.284	21.422	<.001	.505
	Greenhouse-Geisser	1390.567	1.145	1214.242	21.422	<.001	.505
	Huynh-Feldt	1390.567	1.226	1134.326	21.422	<.001	.505
	Lower-bound	1390.567	1.000	1390.567	21.422	<.001	.505
time * group	Sphericity Assumed	19.321	2	9.661	.298	.744	.014
	Greenhouse-Geisser	19.321	1.145	16.871	.298	.621	.014
	Huynh-Feldt	19.321	1.226	15.761	.298	.636	.014
	Lower-bound	19.321	1.000	19.321	.298	.591	.014
Error(time)	Sphericity Assumed	1363.172	42	32.456			
	Greenhouse-Geisser	1363.172	24.050	56.682			
	Huynh-Feldt	1363.172	25.744	52.951			

	Lower-bound	1363.172	21.000	64.913

Table 9

Results of tests of within-subjects contrasts

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
time	Linear	711.147	1	711.147	15.933	<.001	.431
	Quadratic	679.421	1	679.421	33.502	<.001	.615
time *	Linear	10.625	1	10.625	.238	.631	.011
group	Quadratic	8.696	1	8.696	.429	.520	.020
Error(time)	Linear	937.288	21	44.633			
	Quadratic	425.884	21	20.280			

Table 8 shows the F-tests for time, corrected for non-sphericity, were significant in all corrections (Greenhouse-Geisser: $F = 21.422$, $df = 1.145$, $p < .001$; Huynh-Feldt: $F = 21.422$, $df = 1.226$, $p < .001$; Lower-bound: $F = 21.422$, $df = 1.000$, $p < .001$). This indicates a significant effect of time on the vocabulary acquisition of the participants The Partial Eta Squared of 0.505 suggests that over half of the variance in vocabulary scores can be attributed to the changes over time. The interaction effect between time and group was not significant (Greenhouse-Geisser: $F = .298$, $df = 1.145$, $p = .812$; Huynh-Feldt: $F = .298$, $df = 1.226$, $p = .812$; Lower-bound: $F = .298$, $df = 1.000$, $p = .812$), which indicates that the different learning tools (digital vs. traditional) did not differentially affect the changes in vocabulary acquisition over time. This result implies that both digital and traditional learning tools can effectively support vocabulary acquisition for Chinese EAL adult learners in automotive industry.

The results from the MANOVA revealed significant multivariate effects of time on the dependent variables ($p < .001$), which indicates a strong influence of time on the vocabulary acquisition and retention measures. The Partial Eta Squared value of 0.632 suggests that approximately 63.2% of the variance in the dependent variables can be attributed to the factor of time. However, the interaction between time and the groups was not statistically significant ($p = 0.812$). This suggests that the changes in vocabulary scores over time did not differ significantly between the groups using digital versus traditional learning methods.

4.2.2 Discussion on the quantitative data

According to the quantitative data result, while digital group maintained higher absolute scores across all tests, the traditional group demonstrated a higher rate of memorization and better relative retention from their initial knowledge level.

4.2.2.1 Comparison of Memorization Rate Between Digital and Paper Groups

By comparing the increase from the pre-test to the post-test, it was shown that digital group had an increase of 9.36 points from the pre-test to the post-test, while traditional group saw a higher increase of 11.84 points from the pre-test to the post-test. Although the digital group started higher and scored higher in the post-test, the traditional group actually showed a greater increase from pre-test to post-test, indicating a higher rate of memorization. The initial hypothesis posited that digital tools would be superior due to their interactive capabilities, which can stimulate more engagement and potentially better memorization. The fact that the traditional group outperformed the digital group in terms of raw score improvement challenges this assumption but does not necessarily deny the benefits of digital tools. There is a possibility that using a digital learning tool might not directly translate into immediate memorization gains but could influence other aspects of learning efficiency. While traditional methods showed a higher rate of immediate memorization, the broader pedagogical value of digital tools in engaging learners and providing a variety of learning stimuli should not be overlooked. Therefore, further interviews were conducted to investigate participants' learning experience of using both learning tools.

4.2.2.2 Comparison of Retention Rate Between Digital and Paper Groups

By comparing the delayed post-test scores with the pre-test scores, digital group showed a net gain of 6.91 points from pre-test to delayed post-test, while traditional group had a net gain of 8.84 from pre-test to delayed post-test. The traditional group retained more of their gains relative to their starting point compared to digital group. It indicates that while the digital group had a slight advantage in delayed post-test performance, the traditional group was more effective in retaining the vocabulary over time. The non-significant interaction between time and the groups in the MANOVA analysis suggests that the differences in retention might not be as pronounced across different learning tools. This result does not necessarily undermine the potential of digital tools for long-term learning. Therefore, it is important to investigate how digital and traditional tools can be integrated effectively to support both immediate learning outcomes and long-term retention, emphasizing the need for educational strategies that leverage the strengths of both approaches.

4.3 Qualitative Data Analysis

4.3.1 Semi-structured interviews

For the qualitative aspect of this study, five participants were selected for in-depth interviews based on their score dynamics and group assignment to ensure diverse perspectives. Three participants were from the digital group, and two were from the traditional group. Their score changes from pre-test to post-test to delayed post-test displayed varied patterns of learning and retention, making their insights particularly valuable for understanding different impacts of the learning methods. Table M shows the pre-, post-, and delayed post-test scores of the five participants selected for the interviews. In the digital group, participants A6, A7, and A8 were chosen, because A6 demonstrated sustained vocabulary retention, starting with a pre-test score of 37, increasing to 40 in the post-test, and reaching 41 in the delayed post-test. In contrast, A7 showed a decline, with scores decreasing from 38 in the pre-test to 33 in the post-test, and remaining stable in the delayed-post test. A8 exhibited strong initial learning with minor retention loss, with scores significantly rising from 16 in the pre-test to 37 in the post-test, then slightly declining to 36 in the delayed post-test. In the traditional group, B11 and B10 were chosen, because B11 displayed initial learning but experienced a retention loss,

with scores moving from 16 in the pre-test to 31 in the post-test, then decreasing to 23 in the delayed post-test. Meanwhile, participant B10 showed progressive learning and enhanced retention; their scores increased from 17 in the pre-test to 31 in the post-test and improved further to 33 in the delayed post-test.

Table 10

Interviewees' information of test scores and reasons to be selected

Group	Participant Number	Pre-test Score	Post-test Score	Delayed Post-test Score	Reasons for choosing the participants
Digital	A-6	37	40	41	Scores increased from the pre-test to the post-test and continued to rise in the delayed post-test, showing sustained retention.
	A-7	38	33	33	Scores decreased from the pre-test to the post-test and remained stable in the delayed post-test, showing a decline followed by consistent retention.
	A-8	16	37	36	Scores rose significantly from the pre-test to the post-test and slightly declined in the delayed post-test, suggesting

					strong initial learning with minor retention loss.
Traditional	B-11	16	31	23	Scores increased significantly from the pre-test to the post-test but declined in the delayed post-test, indicating initial learning followed by a loss in retention.
	B-10	17	31	33	Scores increased from the pre-test to the post-test and improved further in the delayed post-test, indicating progressive learning and enhanced retention.

The semi-structured interview format was chosen to allow for flexibility in probing deeper into participants' experiences while maintaining focus on predefined themes. This approach facilitated rich, detailed responses that could be adaptively explored further based on participants' initial responses. The interviews centered around four main themes: Learning Tools, Learning Experience, Scoring Impact, and Motivation Impact. Nine interview questions were designed and listed below. These themes were crafted to uncover challenges, benefits, motivational factors, and the effectiveness of the learning methods used in the study. The interviews aim to capture the participants' experiences and perceptions of the learning tools.

Interviews were conducted in Chinese, the participants' native language, using Microsoft Teams, enabling real-time communication and the advantage of recording the sessions for accuracy in data capture. Each session was subsequently transcribed to ensure that

all qualitative data were accurately and comprehensively analyzed. The transcription process was meticulous, aiming to capture nuances in language that might indicate subtler aspects of participant attitudes and experiences. After transcription, a thematic coding approach was employed to analyze the data. This method was instrumental in identifying and categorizing patterns or themes within the transcriptions, allowing for a systematic exploration of how different factors influenced vocabulary learning outcomes. The coding process was iterative, involving repeated reviews of the data to refine the themes and ensure they accurately represented the participants' experiences and perspectives.

The primary purpose of these semi-structured interviews was to complement the quantitative data by providing deeper insight into the personal experiences, perceived effectiveness, and emotional responses to the learning methods used. By integrating these qualitative insights with the quantitative data, the study aims to offer a more holistic understanding of the impact of digital versus traditional vocabulary learning tools on Chinese adult EAL learners in the automotive industry. This comprehensive analysis helps in identifying not just what changes occur, but why these changes might happen, thereby guiding future educational tools and strategies.

4.3.2 Summary of Qualitative Interview Coding

4.3.2.1 Participants’ perceptions of using Quizlet to learn vocabulary

In assessing participants' perceptions of using Quizlet for vocabulary learning, three participants were interviewed. Eight themes were generated from the interview transcripts including positive aspects of the learning experience, motivation, limitations and areas for improvement, comparison with Duolingo, challenges, effectiveness of digital tools, scoring impact, and learning preference, which have been quantified based on frequency of mentions. In general, participants’ views of the effectiveness of using Quizlet to learn vocabulary varied. Two out of three participants had generally positive learning experience while using Quizlet during the four-week vocabulary learning period, however, one reported that the assistance from Quizlet was not very significant, and attributed her improvement in scores partly to luck, and repeated practice instead of the use o f the digital tool, questioning the effectiveness of the

app.

In terms of participants' learning experience, three participants interviewed reported positive learning experience. The most mentioned functions were Flashcards, Learn, Test, and Match, which were highlighted by three participants for 13 times across responses as beneficial for learning vocabulary. Flashcards allow students to see vocabulary on digital cards that can be flipped to reveal definitions and pictures with a click or tap. In this study's Quizlet vocabulary set, the flashcards were designed to show English business words on the front and their Chinese definitions and pictures with a click or tap on the back of the card. In the Learn mode, learners engage with multiple-choice and writing questions that progress from easy to difficult, helping them to learn words and their meanings. The Test function provides an assessment with written, multiple-choice, matching, and True or False questions based on the vocabulary set in this study, allowing learners to check their scores and review correct answers for any mistakes. The Match game challenges learners to quickly pair terms with their definitions or corresponding pictures, displaying their score and rank among other users upon completion. In participants' responses, Test and Match were praised for their utility in allowing learners to effectively eliminate incorrect options and confirm the correct ones and providing guidance in learning vocabulary. One participant noted in the interview that:

> *The most helpful functions were Test and Match…..Sometimes knowing a word might not mean you remember it well, but elimination can help you guess the meanings, which can then be confirmed by another test. It also provides some guidance and specificity. The functions I found most helpful were flashcards, learn, and test, especially the test which allows me to constantly assess my grasp of the words.*

Platzer's (2020) research on the role of Quizlet in vocabulary acquisition investigated examined the frequency of participants' use for each of Quizlet's seven functions. The study found that the three most frequently used activities were Match (mean = 8.32), Test (mean = 4.04), and Flashcard (mean = 2.99). Notably, Match and Flashcards require no typing, and Test requires typing only in some instances. The activity that does not involve typing (Match) was used the most frequently (median = 2), indicating that learners are reluctant to engage in tasks requiring

extensive typing. This finding aligns with the finding of this research, where Test and Match were praised for their utility.

One participant also praised Flashcards for allowing learners to listen to pronunciations and providing both English words and Chinese meanings, which targeted their needs for learning pronunciation. They said:

> *I think the flashcards are quite useful. I primarily look at pronunciation; they have both English and Chinese, which I find very helpful. I focus on pronunciation.*

Nation (2001) also mentioned that using flashcards is a time-honored, effective, and efficient method for vocabulary learning.

Besides the four functions in the Quizlet mentioned above, participants also highlighted several other positive aspects of using Quizlet to learn vocabulary. One participant particularly appreciated the convenience of the app, mentioning five times how beneficial it was to use Quizlet anytime and anywhere, especially given their busy work schedule. The app allowed for frequent and convenient study sessions, fitting into fragmented time slots for adult workers in automotive industry. They noted in the interview that:

> *This app is quite convenient for us, making it easy to memorize words; without a lot of time to study continuously, we can only use snippets of time to quickly learn and memorize.*

Hu's (2011) empirical study of vocabulary learning assisted by mobile phones with 24 Chinese adult learners revealed that adult learners perceive mobile phones as effective tools for vocabulary acquisition, appreciating the flexibility to learn anytime and anywhere. Earlier studies have also emphasized the potential of e-learning to occur in various settings such as on the bus, in a café, waiting in line (Kukulska-Hulme, 2018), effectively using the "dead time" (Ballance, 2012).

Another participant pointed out the importance of visual and audio aids, stating that visual aids and the occasional use of audio helped reinforce memory and improve pronunciation. The participant said in the interview that:

> *Some graphic displays help deepen memory. This aspect is particularly good.*

I primarily look at pronunciation….. I focus on pronunciation.

Both visuals and audios were on the Flashcards with a simple click or tap. Adults EAL learners' needs are often more practical and work-related. They require skills that enable them to communicate effectively in English, such as being able to engage in conversations. As a result, they place a significant emphasis on pronunciation, as clear and accurate pronunciation is essential for professional communication. As Gilakjani, A. P. (2012). mentioned pronunciation is essential for EFL learners' communicative competence and confidence, supporting the learners' overall communicative skill.

These positive experiences above were closely tied to the specific Quizlet functions utilized during the study, such as Flashcards, Learn, Test, and Match. The digital nature of the app made it a convenient and flexible tool for vocabulary acquisition, which participants found particularly advantageous. This also indicates why the digital group showed improvements in scores from the pre-test to the post-test and delayed post-test (an increase of 9.36 points from the pre-test to the post-test, and a net gain of 6.91 points from pre-test to delayed post-test), indicating functions of Quizlet provided targeted support to learners.

However, the three participants also mentioned challenges they encountered while using Quizlet and their views on the effectiveness of digital tools for vocabulary learning. The challenges included: inconsistent study habits (one participant noted a lack of daily habit in revising and memorizing words), and a lack of contextual use at work (one participant mentioned that they didn't use the words at work, leading to memory loss). Interestingly, one participant felt that the app was very useful for memorizing words, yet their test scores consistently declined from 38 to 33 to 33. They were puzzled by this discrepancy, as they believed that the app should have helped them improve. The participant noted in the interview that:

The fact that my scores decreased three times actually doesn't match what I learned from this software, so I'm puzzled why, when using this software to learn words, there are still many points lost in the test phase. This is also a surprise to me.

Interestingly, the interview results revealed that participants had markedly different

views on the effectiveness of Quizlet. One participant noted a significant improvement in test scores, attributing this directly to the use of Quizlet. However, another participant expressed that although scores generally improved, the changes were partly due to luck, expressing uncertainty about the app's impact on actual word retention. They believed their score improvements were not because of the app, but rather due to 1) luck and 2) their own repeated practice. They felt the app failed to help adults genuinely remember words, citing that the app's design for word memorization was too shallow. For example, functions like Test and Match focused on quick selection and speed, lacking depth, and did not leave a lasting impression. They mentioned in the interview that:

> *I feel there was a bit of luck involved in these three test results. When redoing the tests, I had some impression of the words but didn't remember them solidly. A lot of it was luck during the tests, but to actually remember the words.*
>
> *I think this app isn't the key to memorize vocabulary, repeated practice is the key.*

The same participant who questioned the effectiveness of the Quizlet also mentioned that they found another app, Duolingo, more effective than Quizlet for several reasons. The first is that Duolingo is more engaging and habit-forming, as its game-like, level-based approach made learning fun and encouraged them to speak up, addressing their biggest challenge of speaking out loud. Another is its structured levels and real-time corrections. Duolingo offered structured levels with multiple sub-levels, including tasks for word memory, spelling, and pronunciation practice with immediate corrections, which they found crucial for effective learning. The third reason is its design and usability. They found Quizlet's matching feature cluttered and chaotic, making it difficult to locate words quickly. They felt the game tested speed rather than memory, suggesting the need for integrating play and learning, real-time corrections, and a well-organized surface design for better effectiveness.

The participants also identified areas for improvement within Quizlet's features. The need for phonetic symbols, better access to pronunciation aids across all modules, the addition of example sentences, and the inclusion of parts of speech were suggested to enhance learning effectiveness.

In addition, motivation, both intrinsic and work-related, played a crucial role in participants' engagement with Quizlet. Work-related motivation was mentioned five times, driven by the need to meet professional English proficiency standards and company incentives. On the other hand, intrinsic motivation was noted six times, reflecting a strong personal commitment to improving English language skills, irrespective of external requirements.

Overall, the integration of feedback from the participants suggests that while Quizlet offers significant advantages for learning vocabulary, there is room for improvement, particularly in making the learning experience more interactive, engaging, and supportive of various learning preferences.

4.3.2.2 Participants' perceptions of using paper material to learn vocabulary

To evaluate participants' perceptions of using paper material for vocabulary learning, interviews were conducted with two participants from the traditional group. Five themes were generated from the interview transcripts including learning preference, limitations of using paper material, positive aspects of the learning experience, motivation, and scoring. Similar to the results from the digital group interviews, the interviews with the paper group revealed diverse opinions on the experience and effectiveness of using paper materials for vocabulary learning. Both participants mentioned the benefits as well as the challenges and limitations of using paper materials. One participant had a generally positive attitude towards the four-week learning experience with paper materials, finding it helpful overall. Another participant, however, felt that the paper materials did not directly aid their learning. Instead, they attributed their improvement in test scores to their own efforts in categorizing and taking notes.

Both participants had positive experience while using paper material and audio files for vocabulary learning. The two participants highlighted the ability to write directly on paper materials as beneficial for memory retention. They believed that writing notes and categorizing words on paper enhanced their memory because "the palest ink is better than the best memory." Additionally, both participants found the audio files helpful for vocabulary learning. They used them for listening and repeating words, which improved their pronunciation and understanding over time, especially for newly learned words like "strategic."

Learning preferences were also mentioned by the two participants. Given their busy work schedules, they expressed their preferences towards using digital tools for vocabulary learning due to the convenience and portability, allowing for more flexible study times. With digital tools, they could access anytime, unlike paper materials that could only be used when they are off duty.

> *For example, our normal working hours are from 8 AM to 6 PM, and during this time, it might not be possible to study these materials because there are many other project matters to attend to. I can only manage to study briefly or after work. I wish it could be like the digital version that I could check anytime, as the paper version can only be looked at during certain times.*

In addition, one participant mentioned grouping similar words by scenes or phonetic features was particularly helpful for vocabulary memorization and retention, suggesting categorizing words based on characteristics or contexts. Notably, they attributed his progress mainly to their own categorization and note-taking efforts, rather than the inherent design of the paper materials. They said:

> *The main reason is that I categorized and took notes myself; the paper-based materials didn't directly help deepen my memory.*

Additionally, one participant emphasized the importance of repeated practice, highlighting that continuous and repeated exposure to vocabulary was crucial for effective memorization. They noted that their vocabulary retention wasn't very strong and needed regular review, underscoring the significance of repeated practice. They mentioned:

> *When memorizing words, sometimes the memory doesn't feel deep, the words are not remembered very solidly, and after a while, they need to be memorized again.*

Beyond learning preferences, they also discussed various limitations encountered during their study, including the need for phonetic symbols on paper materials, especially for challenging words, to aid understanding and pronunciation; the requirement for more self-discipline when using paper materials, particularly given high work pressure and limited professional time; and difficulty studying during normal working hours (8 AM to 6 PM) due

to other work commitments, with paper materials being accessible only at specific times, unlike digital versions. They found memorizing words using paper materials requires additional mnemonic strategies and frequent reviews. Additionally, although there was an increase in vocabulary and reading comprehension, speaking skills showed less improvement, which is more critical for their work.

Similar to the participants in the digital group, they also mentioned having both work motivation and intrinsic interest. Both participants highlighted work motivation—driven by the English requirement for their work, however, only one participant mentioned having an intrinsic interest in learning English. In terms of scoring impact, one participant felt that scores could reflect their proficiency and help them improve, therefore, it influences her vocabulary learning. Conversely, another participant viewed scores only as an assessment tool, valuing the practical application of the learnt vocabulary more. Therefore, scores did not significantly drive his vocabulary learning efforts.

Chapter 5 Discussion and Conclusion

5.1 Overview of the study

The purpose of this study was to investigate the benefits and limitations of digital vocabulary learning applications on Chinese adult EAL learners in the automotive industry, with a focus on business English proficiency.

To study this, the digital group used Quizlet as a learning tool to memorize business English vocabulary, while the traditional group used printed vocabulary lists and audio files for the same purpose. The results of the test scores were compared and analyzed. In addition to the tests, this study also investigated the participants' perception of learning methods by conducting semi-structured interviews with five participants, three from digital group and two from traditional group.

The results obtained based on the study would be explained concerning the research questions in the following sections. Based on the results obtained through the mixed-methods research results, this study conclusion was determined. Further, the study's pedagogical implications, limitations of the study, and directions for further research are addressed.

5.2 Answers to the Research Questions

Research question 1: Does the use of a mobile-assisted language learning tool such as Quizlet enhance business English vocabulary acquisition compared to traditional vocabulary learning method for Chinese adult EAL learners in automotive industry?

The quantitative data analysis showed that the use of a digital tool such as Quizlet did enhance business English vocabulary acquisition over time for Chinese adult EAL learners in the automotive industry within this study constraint, but the enhancement effect did not statistically differ from the traditional method of using paper materials in terms of vocabulary memorization and retention. The qualitative data revealed that Quizlet has specific features that enhance business English vocabulary acquisition, particularly in terms of its interactive features, convenience and flexibility, as well as visual and audio aids; however, its effectiveness in enhancing business English vocabulary acquisition compared to traditional methods varied among adult EAL learners.

The statistical analysis revealed significant improvements in vocabulary test scores over time across both the digital and traditional groups. While both methods showed improvements from the pre-test through the post-test and to the delayed post-test, the interaction effect between time and group was not statistically significant ($p = 0.812$). This suggests that while vocabulary acquisition improved over time, the use of Quizlet did not statistically enhance vocabulary acquisition more than traditional methods within the constraints of this study. The null effect could be explained by the limited sample size. This has to be tested by further research with a larger sample size to achieve sufficient power and provide more comprehensive conclusion on the effectiveness of Quizlet compared to paper materials in enhancing business English vocabulary acquisition for learners in this study.

Qualitatively, there are mixed perceptions of Quizlet's effectiveness in enhancing business English vocabulary acquisition within this study constraint. Some participants found Quizlet highly effective in enhancing business English vocabulary acquisition, but others questioned its impact on long-term retention, pointing to the need for more depth in its learning design. Some reported significant improvements in test scores due to the use of Quizlet, attributing this to the app's interactive features such as Flashcards, Learn, Test, and Match, engage learners in multiple ways, keeping learners engaged and caters to different learning preferences. Others expressed skepticism about the app's effectiveness, attributing their score improvements to luck and repeated practice rather than the app itself. They felt that the app's design for word memorization was too shallow and lacked depth for long-term retention. Therefore, improving deeper engagement and forming consistent study habits were highlighted for further improvement in Quizlet. Similarly, although the traditional group showed improvements in vocabulary acquisition over time within this study, and had higher rates of memorization and retention compared to the digital group (memorization: 11.84 points vs. 9.36 points; retention: 8.84 points vs. 6.91 points), there were mixed perceptions of its effectiveness. Interestingly, it was shown in the qualitative data that while paper materials offered benefits such as memory retention, participants expressed a preference for the convenience and flexibility of digital tools for vocabulary learning. Paper materials were praised to improve

their vocabulary and reading comprehension but did not help with speaking skills. Participants in the traditional group highlighted the importance of repeated practice, self-discipline, and personalized vocabulary memorizing strategies such as categorization and writing down in effective vocabulary retention.

Therefore, the choice between digital and traditional methods may thus be influenced more by individual learning preferences, convenience and flexibility, and the specific features of the learning tools, rather than the inherent effectiveness of the tools themselves. Participants praised the convenience of using Quizlet to learn business English vocabulary, which allowed for flexible study time; however, traditional methods were valued for the ability to write directly on paper materials for repeated practice. Both methods highlighted the importance of repeated practice, structured learning, and personalized vocabulary learning strategies such as categorization for effective vocabulary retention.

Research question 2: Does the use of mobile-assisted vocabulary learning applications increase the rate of memorization compared to analog strategies?

Multivariate Tests revealed significant effects of time on vocabulary test scores (Wilks' Lambda = .368, $F(2, 20) = 17.168$, $p < .001$, partial eta squared = .632), indicating while digital tools like Quizlet are effective for enhancing vocabulary learning among Chinese adult EAL learners in the automotive industry, they do not significantly outperform traditional paper-based methods in terms of the rate of memorization. Descriptive statistics indicate that both groups improved their vocabulary knowledge as evidenced by the increase in scores from the pre-test to the post-test. The traditional group saw an increase of 11.84 points from the pre-test to the post-test, while the digital group saw an increase of 9.36 points. However, the lack of a significant time*group interaction effect suggests that the rate of memorization did not significantly differ between the digital and traditional methods.

From the interviews with the digital group, it emerged that learners valued the specific functions of the Quizlet app, such as Flashcards, Learn, Test, and Match. They believed that these features helped them understand and remember words more effectively by allowing them to eliminate incorrect options and confirm the correct ones. This interactive approach was

perceived to aid their short-term memorization, making the learning process more engaging and efficient. However, participants also expressed concerns about their long-term retention, suggesting that while digital tools facilitated initial memorization, they were unsure if these effects were as enduring. Notably, one participant expressed skepticism about the app's effectiveness, attributing their score improvements to luck and repeated practice rather than the app itself. They felt that the app's design for word memorization was too shallow and lacked depth for long-term retention.

From the qualitative data from the traditional group, some participants found the ability to write directly on paper materials beneficial for memory retention, citing the physical act of writing as helpful for memorization. However, others found memorizing words using paper materials to be rigid and less effective, requiring additional mnemonic strategies and frequent reviews. A notable insight was that some participants attributed their progress in memorizing vocabulary to categorizing words and repeated practice rather than the specific method used, highlighting the importance of study habits and techniques over the form of learning materials.

In conclusion, while the statistical analysis did not show that digital tools enhance the rate of memorization more than paper materials, the interactive functions of Quizlet were valued by learners for improving memorization. Similarly, paper materials were praised for allowing learners to physically write on them, which was perceived as beneficial for memory retention. Notably, interviews revealed that vocabulary memorization is closely tied to several key factors: 1. repeated practice, 2. consistency in learning and developing a daily habit of memorizing words, 3. the method of categorizing words, and 4. structured learning, such as weekly vocabulary lists that build on each other to promote progressive learning. Therefore, both paper materials and digital tools need to be designed carefully to support these aspects, aiding learners effectively in their vocabulary acquisition.

Research question 3: What are the benefits and limitations of mobile-assisted vocabulary learning applications such as Quizlet for vocabulary retention?

By comparing the delayed post-test scores with the pre-test scores, the digital group showed an increase of 6.91 points (from 30.82 to 37.73), while the traditional group exhibited

an increase of 8.84 points (from 24.08 to 32.92). Retention rates did not differ significantly between the two groups, showing that although both groups demonstrated improvements, neither digital nor traditional methods provided a retention advantage over the other. Quantitatively, it indicated that both methods have a positive effect on vocabulary retention. However, the qualitative data revealed mixed feelings about the retention capabilities of digital tools.

One of the main advantages highlighted by the participants in the digital group is the interactive functions such as Flashcards, Learn, Test, and Match, which helped the users understand and remember words more effectively by allowing them to eliminate incorrect options and confirm the correct ones. These features were praised for their ability to aid short-term memorization. Additionally, the convenience of being able to use Quizlet anytime and anywhere was beneficial for the adult learners with busy work schedules. The flexibility of using it anytime during their breaks allowed for frequent and convenient study sessions, fitting into fragmented time slots, which is crucial for adult learners in the automotive industry. Furthermore, visual and audio aids automatically provided in the app's Flashcard function also played a significant role in reinforcing memory and improving pronunciation, which is essential for professional communication at work.

However, the study also identified several limitations of using digital vocabular learning application, specifically Quizlet for vocabulary retention among Chinese adult EAL learners. Participants in the digital group faced challenges related to consistency in learning business English vocabulary, with some noting a lack of daily habit in revising and memorizing words, which affected their retention. Another limitation of using the app Quizlet to learn business English vocabulary was the lack of contextual use at work. The app provided the vocabulary lists which only showed business English words and visual and audio aids; and the Flashcards, Match and Test functions mainly focus on the words and their meanings instead of the contexts in which they can be used. Therefore, the users were not able to practice or reinforce the vocabulary in their professional environment, which led to memory loss. In addition, some participants also felt that the app's design for word memorization was too

shallow, such as Match and Test functions focusing on quick selection and speed rather than deep learning, which did not leave a lasting impression. Furthermore, participants also identified specific areas for improvement, such as including phonetic symbols to aid pronunciation and providing access to pronunciation aids across all functions, not just in the Flashcard. Additionally, example sentences were suggested to add in order to help understand the context and usage of words, and the inclusion of parts of speech were mentioned as participants felt parts of speech were not adequately covered by the app and affected their test performance. Interestingly, while some participants reported significant improvements in vocabulary retention and attributed this to the use of Quizlet, others questioned its effectiveness. One participant believed that their score improvements were due to luck and repeated practice rather than the app itself. They even compared Quizlet with Duolingo, noting that Duolingo's game-like, engaging and intuitive practice design, as well as level-based approach were more engaging and effective for long-term retention compared to Quizlet's more static approach. Duolingo's user-friendly and intuitive features foster better engagement and habit formation compared to Quizlet.

To address the limitations of the digital vocabulary learning tool in order to enhance vocabulary acquisition, several improvements can be made. To address the challenges related to consistency in learning business English vocabulary and to enhance learners' daily habits, the app should incorporate customizable daily reminders and reward consistent practice. In addition, including more level-based, engaging, intuitive, and gamified functions in the app may encourage regular engagement with the app. To address the retention difficulty, integrating professional context into vocabulary exercises such as designing scenario-based activities or simulations where learners can practice vocabulary in realistic business settings can help reinforce the practical use of new words in their professional communication at work. Additionally, incorporating more complex exercises which require deeper understanding such as sentence creation rather than quick selection and speed-based tasks might also help with vocabulary retention. Furthermore, incorporating phonetic symbols for correct pronunciation reference and voice recognition technology for real-time feedback on pronunciation can be

beneficial for improving speaking skills; adding example sentences to the vocabulary lists and Flashcards can also help understanding the context of words, thus further aiding reading and listening comprehension; ensuring that parts of speech are covered can help learners understand how to use new words correct in sentences. Finally, adopting some of the engaging features in Duolingo could enhance Quizlet's effectiveness in vocabulary retention, such as level-based approach where learners can progress through different stages once they master new vocabulary, and gamified exercises. This can provide a sense of achievement and motivation, as well as improve engagement and habit formation. By addressing these issues, Quizlet could become a more effective digital vocabulary learning tool for business English vocabulary retention among Chinese adult EAL learners.

In conclusion, while digital tools like Quizlet provide valuable support for vocabulary learning through interactive features, convenience, and structured learning approaches, their effectiveness for long-term retention is influenced by factors such as consistent use, practical application, and deeper engagement. Further research with larger sample sizes is needed to fully optimize the potential of digital tools for vocabulary retention.

5.3 Further Discussion

5.3.1 Pedagogical Implications

The findings from this study offer significant pedagogical implications for designers of digital vocabulary learning apps, trainers conducting business English training in the automotive industry, and curriculum designers who design training programmes for Chinese adult EAL learners in the automotive industry.

For designers of digital vocabulary learning apps, the findings highlight several benefits of Quizlet, and also provide insights for areas for upgrading digital vocabulary learning apps. The interactive functions in Quizlet such as Flashcards, Learn, Test, and Match, were found to aid short-term vocabulary memorization effectively; the visual and audio aids were found to help with understanding and pronunciation; and digital tools can be particularly useful in creating engaging and flexible learning experiences that fit into the fragmented time slots of busy adult learners. Previous studies have also confirmed the equal effect of digital flashcards

and paper on vocabulary learning outcomes (Hsu, 2013; Sage et al., 2020). These advantages should be maintained. However, quantitative findings indicate no significant difference in vocabulary retention between using digital tool and traditional paper materials, and qualitative findings reveal mixed results in terms of effectiveness. Therefore, the choice between digital and traditional methods may be more influenced by individual learning preferences, convenience and flexibility, and the specific features of the learning tools, rather than their inherent effectiveness. In this case, designers should focus on upgrading apps to cater for adult learners' needs, who nowadays have a significant demand for second language learning for work. For instance, designers could focus on enhancing daily learning habits by incorporating reminders, and personalized schedules; integrating contextual learning with example sentences and scenario-based activities; including spaced repetition, comprehensive quizzes; providing phonetic symbols and voice recognition technology support; adopting a level-based, interactive, and game-like design; providing personalized feedback to foster better engagement.

For trainers who conduct business English training in the automotive industry and curriculum designers who design training programmes, integrating digital vocabulary learning tools into training programmes can provide a blended learning approach, combing the benefits of digital learning method and traditional learning method, making it more interactive and engaging. Trainers can incorporate strategies that promote deeper engagement with vocabulary, such as integrating context-based learning and providing opportunities for practical application of new words in real-life scenarios. Additionally, combining digital tools with traditional methods, such as writing notes and categorizing words, can enhance memory retention and cater to diverse learning preferences. Adult learners usually have fragmented time due to their busy work, making it challenging to study or review paper materials regularly. Digital tools are convenient enough for learning during short breaks and offer interactive functions for testing what they have learnt. Therefore, incorporating digital tools into adult language training programmes can provide greater convenience and flexibility. Additionally, digital tools can also help teachers track adult learners' progress and send reminders, helping with consistent learning. In addition, the findings suggest that incorporating contextual learning through role-

play or work scenario helps bridge the gap between vocabulary acquisition and practical usage. Trainers and curriculum designers can provide adult learners with more work-related scenarios during training programmes, allowing them to practice the vocabulary they have learnt in relevant contexts in order to aid vocabulary retention. Finally, trainers can offer more individualized feedback, which aids vocabulary retention for adult learners. Combining digital tools, traditional learning, contextual learning, and personalized feedback can effectively support adult EAL learners in retaining business English vocabulary.

5.3.2 Impact of Test Scores and Motivation on Vocabulary Acquisition

5.3.2.1 Test Score Impact

Three out of five participants reported that improved test scores increased their motivation and provided a sense of achievement, and the other two felt that the scores did not significantly influence their learning efforts. This variation suggests that for some adult learners test scores could serve as a form of motivation to learn vocabulary as it provides a sense of achievement and serves as a means to evaluate progress and identify areas for improvement. Therefore, for some adult learners, test scores might have a significant motivational impact on their vocabulary learning, as they care deeply about their scores. Their improvement in test performance may be more closely related to their motivation driven by the desire to achieve higher scores rather than the specific learning tools used. In such cases, digital tools for vocabulary learning could include more testing features to motivate those adult learners who find test scores particularly important.

5.3.2.2 Motivation Impact

The study found that both intrinsic and extrinsic motivations played important roles in participants' learning progress with the two learning tools. However, the degree to which these motivations influenced learning varied among participants. Some were driven by work-related language requirements and company incentives for learning English, while others were motivated by intrinsic interest in improving their English. Therefore, it is possible that both extrinsic motivation from their work and intrinsic motivation play significant roles in their

learning progress. The motivations may contribute greatly to the score improvements in both groups, suggesting that the improvements may not be attributed to the learning tools used.

5.3.3 Addressing the Challenges of MALL and Quizlet in Vocabulary Acquisition

In Chapter 2 Literature Review, several challenges associated with the use of MALL and Quizlet for vocabulary acquisition were discussed. In MALL contexts, challenges included limited depth of learning, inconsistent engagement, issues with assessment and feedback, and a lack of personalization. In terms of the challenges specific to Quizlet, varying effectiveness across different study modes, inconsistent engagement with the application, the necessity of teacher monitoring for effective use, and lower effectiveness for productive vocabulary and long-term retention. This study revealed several issues that align with the challenges identified.

Firstly, limited depth of learning did exist. Participants in the study reported that Quizlet's design for word memorization felt shallow, and functions like Test and Match emphasized quick selection over deep learning. This finding supports the concern that MALL may promote superficial learning. However, it was also noted that strategies used by some participants such as spaced repetition, categorization, and note-taking were helpful in vocabulary retention.

Secondly, inconsistent engagement with Quizlet also emerged during the four-week vocabulary memorization period in the study. While most participants remained engaged, some struggled with maintaining consistent study habits. This variation in engagement aligns with the challenges highlighted in the literature. It is worth noting that consistent engagement is closely linked to individual motivation for learning vocabulary. Most participants in the study have both intrinsic and extrinsic motivation, which resulted in their high level of engagement with the application.

In addition, feedback issues were also noted, with one participant mentioning Quizlet's lack of real-time corrections, particularly for pronunciation practice compared to Duolingo, which provide immediate feedback.

Furthermore, the lack of personalization in MALL was another challenge identified in this study. Some participants mentioned that they did not use the newly learned vocabulary in

their work contexts, which led to memory loss. This suggests that while Quizlet is effective for vocabulary acquisition in general, it might not be able to provide contextually relevant learning experiences that are essential for retention, especially in professional settings.

Finally, as consistent with findings of Platzer's (2020) research, participants in this study predominantly used non-typing functions such as Flashcards, Test, and Match. These modes were found to be less effective for promoting productive vocabulary growth. While the study did not directly measure productive vocabulary, participants indicated in the interview that Quizlet was more helpful for receptive skills like reading, rather than for productive vocabulary use like speaking or long-term retention.

5.4 Limitations of the Studies and Areas for Future Studies

5.4.1 Limitation of the participants

The participants selected in this study had varying levels of English proficiency, thus affecting the test results of their business English vocabulary acquisition and retention. Participants self-reported their English proficiency at the start of the experiment via a questionnaire that included the question "How would you rate your level of English?" Sixteen participants identified themselves as basic level, six as intermediate, and one as very basic. However, these self-assessments lacked standardized definitions, meaning each participant's understanding of their proficiency level could differ. Consequently, it is unclear to what extent their actual English proficiency impacted their test results, adding variability to the findings. Moreover, the sample size of 23 participants limits the generalizability of the findings. The power analysis (G*Power=0.0514996 as opposed to the commonly accepted value of 0.80), suggests that a larger sample size is necessary to detect statistically significant differences between the digital and traditional learning methods.

5.4.2 Limitation of the tests

The design of the pre-test, post-test, and delayed post-test also have limitations. Each test included 39 multiple-choice questions and 11 blank-filling questions, assessing word meanings, parts of speech, synonyms, and antonyms. Although the pre-, post-, and delayed post-tests featured different questions, the patterns were consistent to ensure assessment of the

vocabulary knowledge learned during the study. However, vocabulary acquisition involves not only meaning and form but also pronunciation. The testing platform Microsoft Form lacked voice recognition function and audio listening support, preventing assessment of pronunciation mastery. This makes the tests less comprehensive. Furthermore, test scores may not fully reflect the learners' progress. One participant in the digital group expressed frustration about the inconsistency between perceived learning progress and test scores. For instance, this participant's scores were 38 in the pre-test, 33 in the post-test, and 33 in the delayed post-test, but they felt that using the digital tool Quizlet had helped them better understand and memorize the words. In addition, all tests were administered online. Although each test was time-limited to 15 minutes, the study could not control the participants' testing environments, therefore, the authenticity of the test results cannot be guaranteed. Future studies should include comprehensive assessments that include pronunciation, supported by voice recognition and audio listening features.

5.4.3 Limitation of the intervention

During the intervention, the participants in the traditional group were provided with audio for pronunciation, but it was unclear if all participants listened to the audio files. However, the digital group had built-in audio in Quizlet, ensuring consistent access to pronunciation aids. This may have influence the learning outcomes between the two groups. Apart from that, during the four-week vocabulary intervention, the researcher could track the digital group's progress through the Quizlet app's backend, but could only remind the paper group as their progress couldn't be monitored. This means the study could not ensure equal or similar study duration or frequency between the two groups, potentially affecting the test results. However, achieving such conditions in real-life situations is not feasible. In addition, the four-week intervention for vocabulary memorization was relatively short. The interval between the post-test and the delayed post-test was only one week. Therefore, it is difficult to draw definitive conclusions about long-term retention and the sustained impact of the learning tools.

5.4.4 Area for Future Study

Future research should address the limitations identified in this study and explore additional areas to enhance the understanding of digital tools' effectiveness in vocabulary acquisition for adult EAL learners. Conducting studies with a larger and more diverse sample, and more precise measures of participants' English proficiency before starting the experiment will help to achieve sufficient power and allow for more comprehensive conclusions about the effectiveness of digital versus traditional vocabulary learning methods. Future studies should also consider extending the intervention period and increasing the interval between the post-test and delayed post-test to better assess long-term retention and the effectiveness of different vocabulary learning methods over a more extended period. Therefore, conducting a longitudinal study can provide insights into the sustained impact of digital tools on vocabulary retention and the effectiveness of different learning strategies over extended periods. Furthermore, investigating the effectiveness of digital and traditional learning tools across different industries can help to generalize the findings and develop more comprehensive pedagogical strategies and suggestions for app developers.

Importantly, exploring the impact of intrinsic and extrinsic motivations on learning outcomes, such as test scores and work-related incentives, can provide valuable insights and help tailor digital vocabulary learning tools and methods to better suit the needs of adult learners. This includes investigating how test scores, work-related incentives, and personal interest in language learning contribute to learners' progress.

It is also worthwhile to explore why some learners feel that digital tools aid their learning progress but do not see this reflected in their test results. One participant expressed frustration with the disconnect between perceived learning progress with using the digital tool Quizlet and test scores, noting that they felt they had learned the vocabulary, yet their scores declined. This inconsistency might be due to learners' self-perception, where they believe they have mastered the material without truly internalizing it. Investigating this phenomenon could provide deeper insights into the effectiveness of digital tools and the psychological factors affecting vocabulary retention.

By addressing these areas, future research can contribute to the development of more

effective and tailored vocabulary digital learning tools for Chinese adult EAL learners in the automotive industry and beyond.

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Appendix A

Questionnaire

5. On what occasion do you use English at work? (e.g. sending emails, explaining working principles, introducing product parameters, project meetings, etc.) 您在工作中使用英语的场合是什么？（例如发送电子邮件、解释工作原理、介绍产品参数、项目会议等） *

6. When was your most recent English learning experience? 您最近的一次英语学习经验是什么时候？ *

- ◯ Within the last 6 months 半年内
- ◯ Within the last year 1年内
- ◯ 1 year ago 1年前
- ◯ More than 2 years ago 两年以上
- ◯ never studied before 从未学过

7. Self-assessment of English proficiency: How would you rate your level of English? 学员自我评价：您的英语水平如何 *

- ◯ Very basic, hardly understand any English. 非常基础，几乎不懂英语
- ◯ Basic, know some basic vocabulary and grammar. 基础，有一些基本词汇和语法
- ◯ Intermediate, can carry out basic English conversations. 中等，可以进行基本的英语交流
- ◯ Advanced, can fluently engage in business English communication. 高级，可以流利地进行商务英语交流

8. Your self-assessment of self-discipline in learning: 您对自己学习的自律性的评价: *

- ◯ I usually manage to complete assignments and study tasks as planned. 我通常能够按计划完成作业和学习任务
- ◯ I sometimes need extra effort to maintain self-discipline in learning. 我有时需要额外努力来保持学习的自律性
- ◯ I occasionally procrastinate or require external motivation to complete tasks. 我有时会拖延或需要外部激励才能完成任务
- ◯ I find it difficult to maintain self-discipline in learning, often procrastinating or unable to complete tasks on my own. 我很难保持学习的自律性，常常拖延或无法主动完成任务

9. Based on your actual situation, is improving your business English level related to your career prospects, such as promotions or salary increases? 根据您的实际情况，提升商务英语水平是否与您的职业前景相关，比如晋升或涨薪？ *

- ◯ Yes
- ◯ No
- ◯ I don't know.

Appendix B

Word Bank


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Appendix C

Pre-test, Post-test, and Delayed Post-test

Pre-test

阅读每个句子和提供的单词。对于每个题目，选择最能匹配句中关键词意义的选项（a, b, c, d, e）。如果你不知道或不确定正确答案，请选择 e) I don't know 我不知道。请不要查找单词或寻求帮助，以确保测试准确反映你当前的词汇水平。你的诚实回答对我们非常宝贵，将帮助我们更好地满足你的学习需求。
记住，不知道答案是可以的。这个前测的目的是帮助我们了解你已经知道的知识和我们如何帮助你进步。祝你好运！
Read each sentence and the provided words. For each item, choose the option (a, b, c, d, e) that best matches the meaning of the key word in the sentence. If you do not know or are unsure about the correct option, please select e) I don't know. Do not look up words or seek help to ensure the test accurately reflects your current vocabulary level. Your honest answers are valuable and will help us tailor the learning experience to your needs.
Remember, it's okay not to know an answer. The purpose of this pre-test is to assess your current knowledge and identify how we can assist you in improving. Good luck!

2. **INQUIRY**: They opened an inquiry into the missing shipment. * (1分)

- ◯ a) Bill
- ◯ b) Question
- ◯ c) Order
- ◯ d) Box
- ◯ e) I don't know 我不认识这个单词

3. **QUOTATION**: We received a competitive quotation for the bulk order. * (1分)

- ◯ a) Paper
- ◯ b) List
- ◯ c) Price
- ◯ d) Stamp
- ◯ e) I don't know 我不认识这个单词

4. **CONFIRMATION**: Please send a confirmation once you receive the goods. * (1分)

- ◯ a) Map
- ◯ b) Yes
- ◯ c) Send
- ◯ d) Ask
- ◯ e) I don't know 我不认识这个单词

5. **AGREEMENT**: The two companies reached an agreement after long discussions. * (1分)

- ◯ a) Talk
- ◯ b) Plan
- ◯ c) Deal
- ◯ d) Chat
- ◯ e) I don't know 我不认识这个单词

6. **CLIENT**: Our new client has requested a customized service package. * (1分)

- ◯ a) Worker
- ◯ b) Buyer
- ◯ c) Boss
- ◯ d) Friend
- ◯ e) I don't know 我不认识这个单词

7. **AGENDA**: Please review the agenda before the meeting starts. * (1分)

- ◯ a) Book
- ◯ b) Paper
- ◯ c) List
- ◯ d) Note
- ◯ e) I don't know 我不认识这个单词

8. **MEETING MINUTES**: The secretary took meeting minutes during the board meeting. * (1分)

- ◯ a) Notes
- ◯ b) Times
- ◯ c) Records
- ◯ d) Seconds
- ◯ e) I don't know 我不认识这个单词

9. **NEGOTIATION**: The negotiation between the buyer and seller took several hours. * (1分)

- ◯ a) Chat
- ◯ b) Fight
- ◯ c) Talk
- ◯ d) Game
- ◯ e) I don't know 我不认识这个单词

10. **MILESTONE**: The project reached a significant milestone with the successful test. * (1分)

- ◯ a) Stone
- ◯ b) Goal
- ◯ c) Step
- ◯ d) Sign
- ◯ e) I don't know 我不认识这个单词

11. **BUDGET**: The department needs to prepare next year's budget soon. * (1分)

- ◯ a) Money plan
- ◯ b) List
- ◯ c) Balance
- ◯ d) Idea
- ◯ e) I don't know 我不认识这个单词

12. **OBJECTIVE**: Our main objective is to improve customer satisfaction. * (1分)

- ◯ a) Plan
- ◯ b) Idea
- ◯ c) Action
- ◯ d) Target
- ◯ e) I don't know 我不认识这个单词

13. **WARRANTY**: The product comes with a one-year warranty. * (1分)

- a) Promise
- b) Warning
- c) Instruction
- d) Paper
- e) I don't know 我不认识这个单词

中英互译

请选择或填写与所给中文或英文相对应的正确翻译。
Select or write the correct translation corresponding to the given Chinese or English phrase.

14. 物流 * （1分）

- ◯ Promotion
- ◯ Logistics
- ◯ Inventory
- ◯ Procurement
- ◯ I don't know 我不知道

15. Automation * （1分）

- ◯ 自动化
- ◯ 部件
- ◯ 物流
- ◯ 促销
- ◯ I don't know 我不知道

16. m^2 * （1分）

- ◯ Square meters
- ◯ Millimeters
- ◯ Centimeters
- ◯ I square t
- ◯ I don't know 我不知道

17. 质量 * （1分）

18. Component * （1分）

19. Optimize * (1分)

20. 专业的 * (1分)

21. Support * (1分)

22. 品牌 * (1分)

词性选择

根据例句选择对应词汇的正确词性。
Choose the correct part of speech for each word based on its use in the example sentence.

23. 参考例句，选择下列词汇对应的正确词性。例句：During the meeting, the team came up with a **resolution** to solve the production delay issue effectively. 这里的resolution的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

24. 参考例句，选择下列词汇对应的正确词性。例句：The workers completed the **assembly** of the bicycle quickly. 这里的assembly的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

25. 参考例句，选择下列词汇对应的正确词性。例句：Our **logistics** team takes care of shipping the products. 这里的logistics的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

26. 参考例句，选择下列词汇对应的正确词性。例句：We can **enhance** the brightness of this room by adding more lights. 这里的enhance的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

Post-test


The figure originally presented here cannot be made freely available via ORA because of copyright.

Post-test 后测

阅读每个句子和提供的单词。对于每个题目，选择最能匹配句中关键词意义的选项（a, b, c, d, e）。如果你不知道或不确定正确答案，请选择 e) I don't know 我不知道。请不要查找单词或寻求帮助，以确保测试准确反映你当前的词汇水平。你的诚实回答对我们非常宝贵，将帮助我们更好地满足你的学习需求。
记住，不知道答案是可以的。这个前测的目的是帮助我们了解你已经知道的知识和我们如何帮助你进步。祝你好运！
Read each sentence and the provided words. For each item, choose the option (a, b, c, d, e) that best matches the meaning of the key word in the sentence. If you do not know or are unsure about the correct option, please select e) I don't know. Do not look up words or seek help to ensure the test accurately reflects your current vocabulary level. Your honest answers are valuable and will help us tailor the learning experience to your needs.
Remember, it's okay not to know an answer. The purpose of this pre-test is to assess your current knowledge and identify how we can assist you in improving. Good luck!

2. **Partnership** : Our company has a partnership with a firm overseas. * （1分）

- ◯ a) Friendships
- ◯ b) Cooperation
- ◯ c) Conflict
- ◯ d) Groups
- ◯ e) I don't know 我不认识这个单词

3. **QUOTATION**: We received a competitive quotation for the bulk order. * （1分）

- ◯ a) Paper
- ◯ b) List
- ◯ c) Price
- ◯ d) Stamp
- ◯ e) I don't know 我不认识这个单词

4. **Strategy** : We need a good strategy to increase our sales. * （1分）

- ◯ a) Plan
- ◯ b) Game
- ◯ c) Risk
- ◯ d) Chance
- ◯ e) I don't know 我不认识这个单词

5. **Assessment**: Regular assessment helps us improve. * (1分)

- ◯ a) Check
- ◯ b) Guess
- ◯ c) Game
- ◯ d) Idea
- ◯ e) I don't know 我不认识这个单词

6. **Benchmark**: We aim to set a new benchmark in quality. * (1分)

- ◯ a) Middle
- ◯ b) Start
- ◯ c) End
- ◯ d) Standard
- ◯ e) I don't know 我不认识这个单词

7. **Audit**: The financial department is preparing for an audit. * (1分)

- ◯ a) Party
- ◯ b) Review
- ◯ c) Election
- ◯ d) Meeting
- ◯ e) I don't know 我不认识这个单词

8. **Defect**: We must address every defect in our products. * (1分)

- ◯ a) Strength
- ◯ b) Flaw
- ◯ c) Skill
- ◯ d) Advantage
- ◯ e) I don't know 我不认识这个单词

9. **VALIDATION**: The new research required validation from experts. * （1分）

- ◯ a) Start
- ◯ b) Approval
- ◯ c) Cancellation
- ◯ d) Question
- ◯ e) I don't know 我不认识这个单词

10. **Sales Forecast**: We depend on the sales forecast to plan production. * （1分）

- ◯ a) Prediction
- ◯ b) History
- ◯ c) Story
- ◯ d) Record
- ◯ e) I don't know 我不认识这个单词

11. **Consumer**: Every consumer has the right to return a product. * （1分）

- ◯ a) Worker
- ◯ b) Seller
- ◯ c) Buyer
- ◯ d) Engineer
- ◯ e) I don't know 我不认识这个单词

12. **Market Segment**: Our product targets a specific market segment. * （1分）

- ◯ a) Market part
- ◯ b) Whole market
- ◯ c) Beginning
- ◯ d) End
- ◯ e) I don't know 我不认识这个单词

13. **Outstanding**: She is an outstanding member of our team. * (1分)

- a) Usual
- b) Regular
- c) Excellent
- d) Interesting
- e) I don't know 我不认识这个单词

14. **Innovative**: The new design is very innovative. * (1分)

- a) Old-fashioned
- b) Common
- c) Boring
- d) Creative
- e) I don't know 我不认识这个单词

15. **Independent**: She completed the project independently. * (1分)

- a) Alone
- b) Together
- c) Quickly
- d) Slowly
- e) I don't know 我不认识这个单词

16. **Flexible**: Our schedule is quite flexible. * (1分)

- a) Busy
- b) Free
- c) Can change easily
- d) Fixed
- e) I don't know 我不认识这个单词

17. **Inspection**: The car needs an inspection every year. * (1分)

- a) Washing
- b) Checking
- c) Painting
- d) Selling
- e) I don't know 我不认识这个单词

18. **Certification**: After completing the course, she received a professional certification. * (1分)

- a) Training
- b) Tool
- c) License
- d) Idea
- e) I don't know 我不认识这个单词

19. **Compliance**: Cars must be in compliance with safety rules. * (1分)

- a) Following
- b) Leading
- c) Making
- d) Taking
- e) I don't know 我不认识这个单词

20. **Reliability**: A good car has high reliability. * (1分)

- a) Speed
- b) Trust
- c) Size
- d) Color
- e) I don't know 我不认识这个单词

21. **Warranty**: This car's warranty lasts for two years. * (1分)

- a) Paint
- b) Shape
- d) Wheel
- c) Guarantee
- e) I don't know 我不认识这个单词

22. **Promotion**: They offer a special promotion for new car models. * (1分)

- a) Sale
- b) Show
- c) Plan
- d) Talk
- e) I don't know 我不认识这个单词

23. **Capacity**: The factory has a large capacity to produce cars. * (1分)

- a) Size
- b) Speed
- c) Ability
- d) Place
- e) I don't know 我不认识这个单词

中英互译

请选择或填写与所给中文或英文相对应的正确翻译。
Select or write the correct translation corresponding to the given Chinese or English phrase.

24. 外包 * (1分)

- a) Employment
- b) Cooperation
- c) Outsourcing
- d) Investment
- I don't know 我不知道

25. 市场分析 * (1分)

- a) Market Analysis
- b) Product Launch
- c) Customer Service
- d) Branding
- I don't know 我不知道

26. 露点（在一定气压下，空气中的水蒸气 在降温时冷却并凝结成液滴的温度） * (1分)

- a) Melting Point
- b) Boiling Point
- c) Dew Point
- d) Freezing Point
- I don't know 我不知道

27. 温度
* (1分)

- a) Humidity
- b) Temperature
- c) Pressure
- d) Heat
- I don't know 我不知道

28. Clientele * (1分)

- a) 客户关系
- b) 顾客满意度
- c) 客户群
- d) 市场份额
- I don't know 我不知道

29. Endorsement * (1分)

- a) 认可
- b) 证明
- c) 推荐
- d) 背书
- I don't know 我不知道

30. Tolerance * (1分)

- a) 方差
- b) 公差
- c) 标准差
- d) 厘米
- I don't know 我不知道

31. Storage * (1分)

- a) 运输
- b) 存储
- c) 供应
- d) 管理
- I don't know 我不知道

32. 安培 * (1分)

33. 瓦特 * (1分)

34. 伏 * (1分)

35. 额定电流 * (1分)

36. 宽 (n.名词) * (1分)

37. 长（n. 名词） * (1分)

38. 自动化 * (1分)

39. **Refine**: The engineering team worked tirelessly to **refine** the design of the product. (写出加粗单词的中文意思) * (1分)

40. 提供报价 * （1分）

41. **Fuse technology**: The new product incorporates advanced **fuse technology** for enhanced safety. (写出加粗单词的中文意思) * （1分）

42. **Technical explanations**: The manual provides detailed **technical explanations** for troubleshooting. (写出加粗单词的中文意思) * （1分）

词性选择

根据例句选择对应词汇的正确词性。
Choose the correct part of speech for each word based on its use in the example sentence.

43. 参考例句，选择下列词汇对应的正确词性。例句：The new manufacturing process in the automotive industry is more **efficient**, reducing production time. 这里的**efficient**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

44. 参考例句，选择下列词汇对应的正确词性。例句：The automotive manufacturer seeks to **optimize** fuel efficiency in its new car models. 这里的**optimize**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

45. 参考例句，选择下列词汇对应的正确词性。例句：The automotive sales **exceeded** projections due to high demand for electric vehicles. 这里的**exceed**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

46. 参考例句，选择下列词汇对应的正确词性。例句：The automotive supply chain includes **warehousing** facilities for storing vehicle components. 这里的**warehousing**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

47. 参考例句，选择下列词汇对应的正确词性。例句：The automotive import process involves complying with **customs** regulations and tariffs. 这里的**customs**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

48. 参考例句，选择下列词汇对应的正确词性。例句：The company aims to develop **environmentally** friendly vehicles to reduce carbon emissions. 这里的**environmentally**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

49. 参考例句，选择下列词汇对应的正确词性。例句： Please **confirm** your order for automotive parts by replying to this email. 这里的**confirm**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

50. 参考例句，选择下列词汇对应的正确词性。例句： The automotive industry contributes significantly to the country's **export** revenue through vehicle sales abroad. 这里的**export**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

51. 参考例句，选择下列词汇对应的正确词性。例句： The automotive engineer demonstrated **professional** expertise in designing the vehicle's safety features. 这里的**professional**的词性是 * （1分）

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

Delayed Post-test

Delayed Post-test 后测2

阅读每个句子和提供的单词。对于每个题目，选择最能匹配句中关键词意义的选项（a, b, c, d, e）。如果你不知道或不确定正确答案，请选择 e) I don't know 我不知道。请不要查找单词或寻求帮助，以确保测试准确反映你当前的词汇水平。你的诚实回答对我们非常宝贵，将帮助我们更好地满足你的学习需求。
记住，不知道答案是可以的。这个前测的目的是帮助我们了解你已经知道的知识和我们如何帮助你进步。祝你好运！
Read each sentence and the provided words. For each item, choose the option (a, b, c, d, e) that best matches the meaning of the key word in the sentence. If you do not know or are unsure about the correct option, please select e) I don't know. Do not look up words or seek help to ensure the test accurately reflects your current vocabulary level. Your honest answers are valuable and will help us tailor the learning experience to your needs.
Remember, it's okay not to know an answer. The purpose of this pre-test is to assess your current knowledge and identify how we can assist you in improving. Good luck!

2. **Align:** We need to ensure our goals align with the client's expectations. * （1分）

- ◯ a) Match
- ◯ b) Expand
- ◯ c) Reduce
- ◯ d) Delay
- ◯ e) I don't know 我不认识这个单词

3. **Update:** The software in the car must be updated to enhance its navigation system. * （1分）

- ◯ a) Modify
- ◯ b) Paint
- ◯ c) Repair
- ◯ d) Clean
- ◯ e) I don't know 我不认识这个单词

4. **Meet:** The engineers will meet next week to discuss the new transmission design. * （1分）

- ◯ a) Plan
- ◯ b) Gather
- ◯ c) Talk
- ◯ d) Compete
- ◯ e) I don't know 我不认识这个单词

5. **Research:** Our team is researching new ways to reduce emissions from car engines. * (1分)

- ◯ a) Ignore
- ◯ b) Investigate
- ◯ c) Reduce
- ◯ d) Copy
- ◯ e) I don't know 我不认识这个单词

6. **Enhance:** Using high-quality parts can enhance the performance of the vehicle. * (1分)

- ◯ a) Reduce
- ◯ b) Improve
- ◯ c) Compete
- ◯ d) Neglect
- ◯ e) I don't know 我不认识这个单词

7. **Automated:** The factory uses robots for automated assembly of the cars. * (1分)

- ◯ a) Manual
- ◯ b) Mechanized
- ◯ c) Interrupted
- ◯ d) Slowed
- ◯ e) I don't know 我不认识这个单词

8. **High Quality:** Every vehicle we produce must meet high quality standards. * (1分)

- ◯ a) Excellence
- ◯ b) Problem
- ◯ c) Accuracy
- ◯ d) Advantage
- ◯ e) I don't know 我不认识这个单词

9. **Comprehensive:** The vehicle inspection includes a comprehensive check of all systems. * (1分)

- ◯ a) Thorough
- ◯ b) Limited
- ◯ c) Incomplete
- ◯ d) Partial
- ◯ e) I don't know 我不认识这个单词

10. **Advanced:** The new model features technology that is highly advanced. * (1分)

- ◯ a) Sophisticated/advantaged
- ◯ b) Problematic
- ◯ c) Basic
- ◯ d) Outdated
- ◯ e) I don't know 我不认识这个单词

11. **Deadline:** The project deadline is fast approaching, and we need to finalize the designs. * (1分)

- ◯ a) Extension
- ◯ b) Start date
- ◯ c) Due date
- ◯ d) Opening
- ◯ e) I don't know 我不认识这个单词

12. **Priority:** Safety features are the top priority when designing new vehicles. * (1分)

- ◯ a) The first thing to do
- ◯ b) The last thing to do
- ◯ c) Problem
- ◯ d) Advantage
- ◯ e) I don't know 我不认识这个单词

13. **Risk:** Testing high speeds in new cars involves a considerable risk. * (1分)

- a) Difficulty
- b) Safety
- c) Security
- d) Danger
- e) I don't know 我不认识这个单词

14. **Outcome:** The outcome of the safety tests will determine the car's market readiness. * (1分)

- a) Result
- b) Process
- c) Method
- d) Action
- e) I don't know 我不认识这个单词

15. **Inventory:** Maintaining an accurate inventory is crucial for quick parts availability. * (1分)

- a) Shortage
- b) Stock
- c) Invention
- d) Creation
- e) I don't know 我不认识这个单词

16. **Logistics:** Efficient logistics are key to ensuring timely delivery of auto parts. * (1分)

- a) Assembly
- b) Logic
- c) Production
- d) Transportation
- e) I don't know 我不认识这个单词

17. **Procurement:** Effective procurement of materials is vital for production. * (1分)

- ◯ a) Purchase
- ◯ b) Sale
- ◯ c) Loss
- ◯ d) Expense
- ◯ e) I don't know 我不认识这个单词

18. **Shipment:** The shipment of new cars to dealers must be handled with care to avoid damages. * (1分)

- ◯ a) Collection
- ◯ b) Storage
- ◯ c) Delivery
- ◯ d) Loss
- ◯ e) I don't know 我不认识这个单词

19. **Distribution:** The company manages the distribution of cars to various dealers. * (1分)

- ◯ a) Delivery
- ◯ b) Gathering
- ◯ c) Selling
- ◯ d) Producing
- ◯ e) I don't know 我不认识这个单词

20. **Feedback:** Customer feedback is essential for improving car design. * (1分)

- ◯ a) Purchase
- ◯ b) Trust
- ◯ c) Comments
- ◯ d) Reaction
- ◯ e) I don't know 我不认识这个单词

21. **Engine:** A powerful engine is installed to ensure the car performs well under all conditions. * (1分)

- ◯ a) Motor
- ◯ b) Wheel
- ◯ c) Chassis
- ◯ d) Brake
- ◯ e) I don't know 我不认识这个单词

22. **Promotion**: They offer a special promotion for new car models. * (1分)

- ◯ a) Sale
- ◯ b) Show
- ◯ c) Plan
- ◯ d) Talk
- ◯ e) I don't know 我不认识这个单词

23. **Transmission:** The car's transmission needs to be smooth to ensure a comfortable drive. * (1分)

- ◯ a) Engine
- ◯ b) Brakes
- ◯ c) Gearbox
- ◯ d) Wheels
- ◯ e) I don't know 我不认识这个单词

中英互译

请选择或填写与所给中文或英文相对应的正确翻译。
Select or write the correct translation corresponding to the given Chinese or English phrase.

24. 电动汽车 * （1分）

- ◯ a) Hybrid vehicles
- ◯ b) Electric cars
- ◯ c) Fuel vehicles
- ◯ d) Solar cars
- ◯ I don't know 我不知道

25. 电池组 * （1分）

- ◯ a) Energy cells
- ◯ b) Power units
- ◯ c) Battery packs
- ◯ d) Current bundles
- ◯ I don't know 我不知道

26. 充电站 * （1分）

- ◯ a) Power banks
- ◯ b) Charging stations
- ◯ c) Energy terminals
- ◯ d) Refueling areas
- ◯ I don't know 我不知道

27. 充电桩
* （1分）

- a) Charging columns
- b) Charging piles
- c) Electric posts
- d) Power poles
- I don't know 我不知道

28. High-voltage boxes * （1分）

- a) 高压电缆
- b) 高压箱
- c) 电力线路
- d) 电压开关
- I don't know 我不知道

29. Charging units * （1分）

- a) 电池充电
- b) 充电站点
- c) 充电单元
- d) 电力单元
- I don't know 我不知道

30. Power protection * （1分）

- a) 电源管理
- b) 电源扩展
- c) 电力供应
- d) 电源保护
- I don't know 我不知道

31. Telecom industry * (1分)

- ◯ a) 电子行业
- ◯ b) 通讯行业
- ◯ c) 电信行业
- ◯ d) 广播行业
- ◯ I don't know 我不知道

32. 生产线 * (1分)

33. 自动化生产线 * (1分)

34. 交货能力 * (1分)

35. 变流器 * (1分)

36. 利润 * (1分)

37. 投资（n. 名词） * (1分)

38. 额定电压 * (1分)

39. **Mission**: The automotive company's **mission** is to lead the market in electric vehicle innovation and sustainability. * (1分)

40. 摄氏度 * (1分)

41. **Encourage**: To **encourage** innovation, the car manufacturer awards grants to engineers for developing eco-friendly technologies. * (1分)

42. **Strategic Promotion**: The auto brand's **strategic promotion** of their latest hybrid model aims to target environmentally conscious consumers. * (1分)

词性选择

根据例句选择对应词汇的正确词性。
Choose the correct part of speech for each word based on its use in the example sentence.

43. 参考例句，选择下列词汇对应的正确词性。例句：The supplier sent a detailed **quotation** for the car parts needed.这里的**Quotation**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

44. 参考例句，选择下列词汇对应的正确词性。例句： The company must **adhere** to strict quality standards in car manufacturing. 这里的**adhere**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

45. 参考例句，选择下列词汇对应的正确词性。例句：Engineers and designers **collaborate** closely to develop new car models. 这里的**Collaborate**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

46. 参考例句，选择下列词汇对应的正确词性。例句：The customer service team will **handle** all inquiries regarding the latest vehicle recall. 这里的**handle**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

47. 参考例句，选择下列词汇对应的正确词性。例句：The new model includes a **sensor** to detect parking distance. 这里的**Sensor**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

48. 参考例句，选择下列词汇对应的正确词性。例句：The production process has been optimized to **maximize** efficiency. 这里的**maximize**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

49. 参考例句，选择下列词汇对应的正确词性。例句：The customer's **confirmative** response to the order query was a relief to the support team. 这里的**confirmative**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

50. 参考例句，选择下列词汇对应的正确词性。例句：The project manager will **outline** the steps required to achieve the production goals. 这里的**outline**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

51. 参考例句，选择下列词汇对应的正确词性。例句：The finance department conducts an annual **audit** of the company's accounts. 这里的**audit**的词性是 * (1分)

- ◯ noun 名词
- ◯ verb 动词
- ◯ adverb 副词
- ◯ adjective 形容词
- ◯ pronoun 代词
- ◯ I don't know 我不知道

Appendix D

Qualitative Interview Coding

Digital group's Interview Coding

Theme	Code	Description	Number of participants	Frequency
Positive Aspects of the Learning Experience (Frequency: 22)	Flashcards, learn, test, match functions	The participant found specific features of the Quizlet app, like o flashcards, learning, test and match functions, exceptionally beneficial for learning vocabulary. These tools helped them understand and remember words more effectively by allowing them to eliminate incorrect options and confirm the correct ones.	3	13
	Structured Learning	The app provided a systematic approach to learning, with weekly vocabulary lists that built on each other, promoting progressive learning.	1	3
	Visual and Audio Aids	Visual aids and the occasional use of audio helped in reinforcing memory and pronunciation.	1	1
	Convenience	Participant appreciated the ability to use Quizlet anytime and anywhere, which was particularly beneficial for those with busy schedules. The app allowed for frequent and convenient study sessions, fitting into fragmented time slots.	1	5

Motivation (Frequency: 11)	Work Motivation	Work-related needs and the desire to communicate more effectively in English provided additional motivation.	3	5
	Intrinsic Motivation	The participant was self-motivated to learn and appreciated the structured approach to vocabulary acquisition.	3	6
Limitations and Areas for Improvement (Frequency: 5)	Phonetic Symbols	There was a need for phonetic symbols to aid in pronunciation.	1	1
	Pronunciation Access	There was a desire for easier access to pronunciation aids across all modules, not just in the flashcard section.	1	1
	Example Sentences	Example sentences were suggested to add to help understand the context and usage of words.	1	1
	Inclusion of Parts of Speech	The participant felt the app did not adequately emphasize learning the parts of speech, which affected their test performance.	1	2
Comparison with Duolingo (Frequency: 4)	integrating play and learning	Appreciated Duolingo's game-like, engaging structure, which contrasts with Quizlet's more static approach.	1	1
	Real-time Corrections	Duolingo provided immediate feedback and corrections, which helped learners understand and correct their mistakes instantly, an aspect lacking in Quizlet.	1	2
	Not Easy to use	Duolingo was found to be more user-friendly and intuitive, fostering better engagement and habit formation compared to Quizlet.	1	1

	Consistency in Learning	The participant noted a lack of daily habit in revising and memorizing words, which they felt might have contributed to their inconsistent test scores.	1	2
Challenges (Frequency: 4)	Inconsistency between perceived learning progress and test score	The participant also expressed some frustration with the disconnect between the perceived learning progress and her test scores, indicating the test score cannot fully represent learners' learning progress.	1	1
	Lack of contextual use at work	The participants didn't use the words at work, leading to memory loss.	1	1
Effectiveness of Digital Tools (Frequency: 3)	Direct impact on test scores	one participant noted a significant improvement in test scores, attributing this directly to the use of Quizlet.	1	1
	not consistently effective	Although scores generally improved, one participant expressed that the changes were partly due to luck, expressing uncertainty about the app's impact on actual word retention.	1	2
Scoring impact (Frequency: 3)	Improved scores increased motivation	Improved scores increased motivation and provided a sense of achievement, while clear feedback helped guide further learning.	2	2
	No impact on motivation	While test scores provided some insight, they did not significantly impact motivation; participants were more driven by their own goals and the necessity to improve for work.	1	1

Learning Preference (Frequency: 1)	Prefer to use paper material	Preferred using paper material for vocabulary learning because the participant can write down notes to aid memorizing vocabulary	1	1

Traditional Group's Interview Coding

Theme	Code	Description	Number of participants	Frequency
Learning Preference (Frequency: 11)	categorizing words	found it easier to remember similar words when grouped together; suggested categorizing words based on characteristics or contexts; grouping words by scenes or similar phonetic features was helpful; adjusted study method for better memorization.	1	5
		it was the key factors in learning progress, rather than inherent design of paper materials.		
	digital tools	Given the choice, preferred using an app for vocabulary learning due to convenience and portability, allowing for more flexible study times.	2	2
	Repeat practice	The participant emphasized the importance of continuous and repeated exposure to vocabulary for effective memorization	1	4
Limiations of using paper material (Frequency: 7)	Need for Phonetic Symbols	Need for phonetic symbols on paper materials, especially for challenging words, to aid understanding and pronunciation.	1	1

	Lack of Self-discipline	Using paper materials requires more self-discipline, particularly given high work pressure and limited professional time.	1	2
	Time Constraints & work load	Difficulty studying during normal working hours (8 AM to 6 PM) due to other work commitments; paper materials accessible only at specific times, unlike digital versions.	1	2
	Rigid Memorization	Found memorizing words using paper materials rigid and less effective; required additional mnemonic strategies and frequent reviews.	1	1
	Less improvement in speaking skills	speaking skills showed less improvement, although there was increase in vocabulary and reading comprehension. Speaking skills are more important at work.	1	1
Positive Aspects of the Learning Experience (Frequency: 5)	Testing System	Appreciated the thoughtful and relevant content of the pre-test, post-test, and delayed post-test, specific to industry and products.	1	1
	Writing down	Ability to write directly on paper materials seen as beneficial for memory retention.	2	2
	Audio Material	Found helpful for studying; used for listening and repeating words, improving pronunciation and understanding over time, especially for less commonly used words like "strategic."	2	2
Motivation (Frequency: 5)	Work Motivation	Motivation to study English driven by the necessity of using English in their job.	2	4
	Intrinsic Interest	Despite external pressures, had a personal interest in learning English and recognized the importance of improving skills.	1	1

Scoring (Frequency: 3)	Desire for knowing Scores	Expressed a desire to know test scores and mistakes, seeing it as a way to measure and improve abilities.	1	1
	Evaluate progress and improvement	scores serving as a means to evaluate progress and identify areas for improvement, unlike past exam-focused learning.	1	1
	Scoring has no impact	Scores do not significantly influence the vocabulary learning	1	1

Appendix E

Ethical Approval Letter

SOCIAL SCIENCES & HUMANITIES
INTERDIVISIONAL RESEARCH ETHICS COMMITTEE
DEPARTMENTAL RESEARCH ETHICS COMMITTEE

Department of Education
15 Norham Gardens, Oxford OX2 6PY
student.curec@education.ox.ac.uk; staff.curec@education.ox.ac.uk

Zenhui Huang zhenhui.huang@education.ox.ac.uk
Department of Education, Social Sciences Division
University of Oxford

22 February 2024

Dear Zenhui Hang,

Research ethics approval

Research title: Exploring the Benefits and Limitations of Digital Vocabulary Learning Applications on Chinese Adult EAL Leaners in Automotive Industry: Implications for Business Communication Proficiency
Research ethics reference: EDUC C1A 24 053

The above application has been considered on behalf of the Education Departmental Research Ethics Committee (DREC) in accordance with the University's procedures for ethical approval of all research involving human participants.

I am pleased to confirm that, on the basis of the information provided to the DREC, ethics approval has now been granted for this study.

Please note the following:

Personal data: It is the responsibility of the PI to ensure that all personal data collected during the project is managed in accordance with the University's guidance and legal requirements.

In-person activities: Any data collection involving in-person interactions with participants must have an up-to-date fieldwork risk assessment in place; further guidance is available from the Safety Office's website.

Amendments: Please notify the committee if you intend to make any amendments to the information in your ethics application as submitted at date of this approval, as all changes must receive ethical approval prior to implementation. The amendment form is available on the SSH IDREC webpage.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to staff.curec@education.ox.ac.uk / student.curec@education.ox.ac.uk or ethics@socsci.ox.ac.uk.

Yours sincerely

James Carroll
DREC Member
cc: Sara Ratner, sara.ratner@education.ox.ac.uk

Appendix F

Online Participant Information Sheet

DEPARTMENT OF EDUCATION
15 Norham Gardens, Oxford OX2 6PY

Sara Ratner
University e-mail:
sara.ratner@education.ox.ac.uk
Zhenhui Huang
zhenhui.huang@education.ox.ac.uk

Exploring the Benefits and Limitations of Digital Vocabulary Learning Applications on Chinese Adult EAL Leaners in Automotive Industry: Implications for Business Communication Proficiency

CUREC Approval Reference: EDUC C1A 24 053

General Information

The aim of this research is to evaluate the effectiveness and limitations of digital tools in facilitating business English vocabulary acquisition among adult EAL learners in China, particularly in automotive industry.

We appreciate your interest in participating in this online task. You have been invited to participate as you are over 18, working in the automotive industry in China, and would like to improve your business English. Your English level is around pre-intermediate to intermediate level, and you can use a mobile phone with the Quizlet app.Please read through this information before agreeing to participate (if you wish to) by ticking the 'yes' box below.

You may ask any questions before deciding to take part by contacting the researcher (details below).

The Principal Researcher is Zhenhui Huang, who is attached to the Department of Education at the University of Oxford. This research is being completed under the supervision of Sara Ratner.

Your participation in this online study will involve two main sessions. The duration of the study will

last for about six weeks. First, you will complete a pre-test on Microsoft Form assessing your current business English vocabulary. Then, over a four-week period, you will either use Quizlet or traditional printed materials to learn 100 business English words each week. Following this, you will take two more tests, one in Week 5 and the other one in Week 6, on Microsoft Form to track your learning progress. Each test would take about 30 minutes of your time. After this, you might be asked for consent to participate in a follow-up interview, and the interview would take about 15 minutes of your time. With your consent, I would like to video record you so I can have an accurate record of our conversation. You can choose turn on your camera or not during the interview. No background knowledge is required. All data will be de-identified by replacing the participants' names with the series of participant numbers in data processing stage. The data collected will be used to identify the benefits and limitations of digital tools in business English vocabulary learning.

Do I have to take part?

No. Please note that participation is voluntary. If you do decide to take part, you may withdraw at any point for any reason before submitting your answers by pressing the 'Exit' button/ closing the browser.

How will my data be used?

The data we will collect that could identify you will be contact details (email address), age, video recording, IP address. Your IP address will not be stored[1]. We will take all reasonable measures to ensure that data remain confidential. We will not publish any data that could directly identify you. All data will be de-identified by replacing the participants' names with a series of participant numbers in data processing stage.

The responses you provide will be stored in a password-protected electronic file on University of Oxford secure servers and may be used in a dissertation. Identifiable information will be deleted as soon as it is no longer required for the research. Research data will be stored for three years.

[1] Guidance is available within CUREC's Best Practice Guidance (06) on Internet-mediated research

The data that we collect from you may be transferred to, stored and/ or processed at a destination outside the UK and the European Economic Area. By submitting your personal data, you agree to this transfer, storing or processing.

Who will have access to my data[2]?

The University of Oxford is the data controller with respect to your personal data and, as such, will determine how your personal data is used in the research. The University will process your personal data for the purpose of the research outlined above. Research is a task that we perform in the public interest. Further information about your rights with respect to your personal data is available from https://compliance.admin.ox.ac.uk/individual-rights.

The results will be written up for a MSc degree.

Who has reviewed this research?

This research has been reviewed by, and received ethics clearance through, a subcommittee of the University of Oxford Central University Research Ethics Committee [reference number].

Who do I contact if I have a concern or I wish to complain?

If you have a concern about any aspect of this research, please speak to Zhenhui Huang, zhenhui.huang@education.ox.ac.uk, or the supervisor Sara Ratner, sara.ratner@education.ox.ac.uk, and we will do our best to answer your query. I/ We will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible:

Social Sciences & Humanities Interdivisional Research Ethics Committee; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Boundary Brook House,

[2] Guidance is available within CUREC's Best Practice Guidance (09) on Data collection, protection and management

Churchill Drive, Headington, Oxford OX3 7GB **OR**

Education Departmental Research Ethics Committee (DREC), email: student.curec@education.ox.ac.uk; Address: Department of Education, University of Oxford, 15 Norham Gardens, Oxford, OX2 6PY.

Please note that you may only participate in this survey if you are 18 years of age or over.

☐ I certify that I am 18 years of age or over

If you have read the information above and agree to participate with the understanding that the data you submit will be processed accordingly, please tick the box below to start.

☐ Yes, I agree to take part

Appendix G

Consent Form (for Online Experiment)

Consent to take part in Exploring the Benefits and Limitations of Digital Vocabulary Learning Applications on Chinese Adult EAL Leaners in Automotive Industry: Implications for Business Communication Proficiency

Central University Research Ethics Committee (CUREC) approval reference: EDUC C1A 24 053

Purpose of Study: The study aims to assess the effectiveness of digital vocabulary learning tools such as Quizlet in enhancing business English vocabulary acquisition and retention among Chinese adult EAL learners in automotive industry, and explore the challenges learners might run across while using the digital tool.

	Please initial each box if you agree with the statement
I confirm that I have read and understand the information sheet for the above research. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
I understand that my participation is voluntary and that I am free to withdraw at any point until 01/08/24, without giving any reason.	☐
I understand who will have access to personal data provided, how the data will be stored and what will happen to the data at the end of the project.	☐
I understand that I will not be identifiable from any publications or reports for specific organisations, presentations, videos, or websites.	☐

I consent to being video recorded.	☐
I understand how videos recordings will be used in research outputs.	☐
Use of quotations: Please indicate your preference (select *one* option): a) I do not wish to be quoted. **or** b) I agree to the use of quotations in research outputs if I am not identifiable.	☐
I give permission for you to contact me again to clarify information.	☐
I understand how to raise a concern or make a complaint.	☐
I agree to take part.	☐
I agree that my personal contact details can be retained in a secure database so that the researchers can contact me about future studies.	YES / NO

_____	dd / mm / yyyy	_____
Name of participant	Date	Signature
_____	dd / mm / yyyy	_____
Name of person taking consent	Date[3]	Signature

[3] To be signed and dated in the presence of the participant. Once this has been signed by both parties the participant should receive a copy of the signed and dated participant consent form. The original signed and dated consent form should be kept with the project's main documents, which must be kept in a secure location.