An investigation of Chinese EFL learners' acceptance of mobile dictionaries in English language learning

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Abstract

The enormous importance of second language learning, paired with the rapid development of mobile-assisted language learning, has led to the increasing use of mobile dictionaries by English as a Foreign Language (EFL) learners at Chinese universities. Although many studies have explored the role of dictionaries in English language learning, few have investigated mobile dictionaries (MDs) from learners' perspectives. This study aimed to explore Chinese EFL learners' acceptance of three types of MDs: monolingual, bilingualised and bilingual. 125 participants used mobile dictionaries in various English learning contexts, especially in reading comprehension and vocabulary learning.

Adapted from Davis's (1989) Technology Acceptance Model and Sharples' (2009) study of evaluating mobile technology, the questionnaire in this study addressed three key themes: (1) perceived ease of use, (2) perceived usefulness, and (3) behavioural intention to use. Analysis shows that the bilingualised MD group reported the most positive perceptions, especially compared to the bilingual MD group. 101 participants participated in semi-structured group interviews to further explore the reasons underlying their perceptions. Several factors impacting learner acceptance, from the micro to the macro level, are proposed and discussed.

As an interdisciplinary study, this research fills theoretical and empirical gaps in investigating mobile-assisted language learning. It offers application designers and language teachers insights into learners' acceptance of MDs. Moreover, it provides recommendations concerning making MDs more personalised, attractive and effective.

Keywords: mobile dictionaries; Chinese EFL learners; perceived ease of use; perceived usefulness; behavioural intention to use

1. Introduction

Mobile learning can be adapted to EFL teaching and learning, both in the second language (L2) classroom and in learners' self-study (Zou et al., 2018). Mobile Assisted Language Learning (MALL) offers learners new learning opportunities, highlighting the continuity and spontaneity of information access and facilitating interaction across different language learning settings (Ahn & Lee, 2016). It provides language learners with a convenient, resourceful and personalised language learning environment, enabling them to acquire a language anywhere and at any time (Puebla et al., 2022). The rapid development of educational technology and the internet are driving a revolution in lexicography (Lew & De Schryver, 2014), offering language learners more chances to learn L2 vocabulary in self-regulated settings (Ko, 2019).

In China, MALL is no longer a novelty. Most Chinese university EFL learners have experience in using various types of MALL platforms (Yu et al., 2018). As a type of commonly-used MALL resources on mobile devices, MDs play a vital role in Chinese EFL learners' self-directed English learning (Hubert, 2017; Zhang & Pérez-Paredes, 2021). However, few previous studies have focused on MDs, especially comparing different types of MDs in L2 education from learners' perspectives (Lin & Lin, 2019).

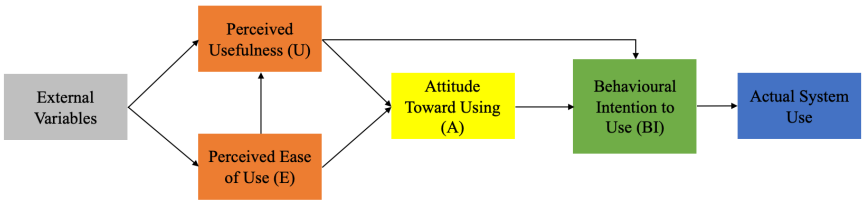
According to Laufer and Hill (2000), if a pedagogical tool is favoured by learners, there is more chance that it will also benefit their learning. In this study, we draw on the well-known Technology Acceptance Model (TAM), aiming to explore Chinese university EFL learners' acceptance of three types of MDs, i.e., monolingual, bilingualised and bilingual. As L2 learning is complex and developmental, we also analyse and discuss possible factors that impact learners' acceptance. The outcomes of focusing on learners' perspectives offer some important potential insights for lexicographers, teachers and researchers. Lexicographers could consider the learner data in MD design and innovation; teachers could probe into learners' perceptions to better understand their learning needs and aims; the learner data could also help researchers conduct studies on self-regulated learning in the CALL context.

2. Technology Acceptance Model (TAM) in MALL

a. The original TAM (Davis, 1989)

TAM (Davis, 1989) emphasises the vital role of learners' acceptance of technology in order for their learning with technology to be successful. Learners' technology acceptance refers to their willingness, agreement and continuous use of information technology (Arning & Ziefle, 2007). As Figure 1 shows, learners' acceptance of MDs is affected by their perceived ease of use and perceived usefulness. Perceived ease of use relates to how easy the learner believes the technology is to use, which often influences its perceived usefulness. Perceived usefulness refers to the degree to which a learner perceives a benefit from using the technology. This impacts their attitudes towards the technology and their actual use of it (Venkatesh & Davis, 2000).

Figure 1 Technology Acceptance Model (Davis, 1989)



Empirically, TAM has been applied in many experimental studies pertaining to information technologies. For instance, Wang et al. (2022) investigated students' adoption of an online English learning system – *CCtalk.* Their results demonstrate that students' perceived ease of use and perceived usefulness significantly impact their attitudes, influencing their behavioural intentions. Park et al.'s (2011) study focuses on Korean university students, using the structural equation modelling technique and the Linear Structural Relationship program to confirm the acceptability of TAM in explaining students' acceptance of mobile learning. Chang et al. (2012) investigated university students' use of personal digital assistants (PDAs) for mobile-assisted English language learning in Taiwan, demonstrating that perceived ease of use and perceived usefulness are antecedent factors affecting learners' acceptance of mobile-assisted English learning. Focusing on MDs, Chan (2010) investigated English as a Second Language (ESL) learners in Hong Kong, showing that the ease of use of a bilingualised MD, such as having a clear layout with the presence of L1, contributes to easy access to word definitions and example sentences. It affects learners' preference for this type of dictionary. In summary, these studies verified that the TAM could efficiently predict and explain learners' acceptance of technology in language learning.

b. TAM 2 (Venkatesh & Davis, 2000) and TAM 3 (Venkatesh & Bala, 2008)

Venkatesh and Davis (2000) extended the original TAM and developed TAM 2, highlighting possible social and cognitive influences on users' perceptions. In TAM 2, constructs relating to social forms (e.g., subjective norms, voluntariness and images) and cognitive forms (e.g., job relevance, output quality, result demonstrability, perceived ease of use) are integrated to explain the predictors of TAM's core elements. To further underscore the significant implications of managerial decision-making on implementing technologies, Venkatesh and Bala (2008) proposed TAM 3, which defines six determinants of perceived ease of use, including computer self-efficacy, perception of external control, computer anxiety, computer playfulness, perceived enjoyment and objective usability. In short, both TAM 2 and TAM 3 showcase the importance of external variables that may affect users' perceived usefulness and ease of use in the sociocultural environment.

Commented [SH1]: Forms of what? Do you mean factors or something?

According to previous studies, many found that external variables could indeed affect technology acceptance directly (e.g., Alfadda & Mehdi, 2021; Barrett et al., 2020; Liu et al., 2010). Liu et al. (2010) invited 436 senior high school students in Taiwan, focusing on whether three external variables (i.e., online course design, user-interface design, and previous online learning experience) could predict the students' acceptance of the online learning community. Results supported all the hypotheses, verifying the positive effects of the three variables. A study of virtual reality (VR) Chinese language learning environments showed an overall positive attitude toward using this VR learning environment (Barrett et al., 2020). Besides, as the students encountered difficulties in interacting within the environment,

the importance of the design of VR learning environments and learners' digital literacies should be highlighted as variables for explaining their acceptance of VR technology. Alfadda and Mahdi's (2021) study, conducted during the COVID-19 pandemic, analysed the correlation between the variables of TAM on the use of the Zoom application for language learning. Focusing on undergraduate EFL students, this study validates the original TAM and discovers the effects of two further variables (i.e., computer self-efficacy and students' experience) on their acceptance of the Zoom application.

3. EFL Learners' acceptance of mobile dictionaries

Empirical studies show that the prevalence of bilingual dictionaries is high. Ma (2019) reported that only 22% of participating Chinese-speaking EFL learners in Hong Kong universities used monolingual dictionaries. In contrast, the bilingual (English–Chinese) dictionary is the most popular type because of its simple user interface, which enables learners to view a word's translation and listen to its pronunciation (Ma, 2019). Nation and Webb (2011) also demonstrated that bilingual dictionaries are more popular and are relatively dominant among learners, although they acknowledged the benefits of monolingual dictionaries in providing more detailed word information.

Zhao (2010) mentioned that one reason for not preferring monolingual dictionaries could be the lack of direct L1 references. Learners at a lower English proficiency level may encounter difficulties in reading English entries without Chinese clues. Supakorn and Panplum's (2022) survey revealed a similar phenomenon. They found that language learners start using bilingual dictionaries and then move on to greater use of monolingual ones as their L2 proficiency develops. Nevertheless, some research (e.g., Thienthong, 2020) has contradicted this, finding that even advanced L2 learners are still prone to rely on L2-L1 and L1-L2 bilingual dictionaries.

With L2 information and L1 translations, bilingualised dictionaries are assumed to be in greater demand. Many Chinese learners prefer to use bilingualised dictionaries rather than other dictionary types mainly because of the combination of comprehensive English explanations and understandable Chinese translations (e.g., Shi & Chen, 2005). However, there are important contradictions that need to be taken into account. Pujol et al. (2006) pointed out that most learners are still prone to paying attention to L1 translations rather than the L2 information in bilingualised dictionaries. One possible reason is that the participants in Shi and Chen's (2005) study were English majors, who are more skillful at using different types of inputs than their non-English major counterparts. Thus, more evidence-based research is needed to systematically understand learners' varying perceptions and their acceptance of MDs.

Commented [SH2]: You need to state the RQ or research focus here, which should stem from the discussion, and include a link from this section on MD to TAM, including the focus on 3 MDs.

4. Methodology

a. Sampling

The study was conducted at three public universities in Mainland China, where students have several years of experience in learning English and using MALL applications. The 125 participants were undergraduates with similar levels of English language proficiency and vocabulary knowledge. They all had prior experience using the three selected MDs. We randomly allocated the participants into three groups: 42 students in the monolingual group, 42 in the bilingualised group and 41 in the bilingual group (see details in Appendix A).

Due to personal reasons or time conflicts, 14 students did not attend the group interview (although they completed the online survey). The 101 participants who were able to participate in the group interview were divided into 23 groups, with four or five students per group. The group interview allocation was mainly based on MD type, aiming to ensure that the discussion focused on the same type of MD. Thanks to the high attendance rate (more than 80%), the group interview data were expected to represent the group of participants reasonably well and to provide insights that might inform our understanding of Chinese EFL learners.

b. Three MDs

The monolingual MD selected for this study was the *Longman Dictionary of Contemporary English*, and its mobile application is called *LDOCE (InApp)*. This application is one of the most influential and widely used learner dictionaries, which is recommended by many higher institutions in China. The bilingualised MD was the bilingualised version of *LDOCE*, named *朗文当代高级英语辞典第六代* in Chinese. It covers all the information in the above-mentioned monolingual MD and includes Chinese definitions and Chinese translations of examples. A well-known, fast and easy-to-use bilingual MD named *英漢字典 EC Dictionary* was also chosen. The three dictionaries are illustrated in Figure 2. They are recommended by the faculty and the course instructors, and learners are equally familiar with all three MDs.

The content is the same among the three MDs. All these MDs are available on mobile devices, including smartphones and tablets. The monolingual and the bilingual MD are free of charge but with advertisements; the bilingualised MD charges 138 RMB (approximately 20 US dollars), and the researchers pay the cost for the participants. The key features of the three MDs are shown in Table 1.

Figure 2 Screenshots of the three MDs

The monolingual MD | The bilingualised MD | The bilingual MD

Table 1 Key features of the three MDs

Commented [SH3]: You've used MDs above – be consistent

MD	Name	Platforms	Hardware requirement	Registration	Price	
Monolingual	LDOCE	iOS, Android, Mac, Windows	Mobile devices or PCs	No	Free with advertisements	**Common content to all apps**
Bilingualised	朗文当代高级英语辞典第六代	iOS, Android, Mac, Windows	Mobile devices or PCs	Yes	138 RMB	
Bilingual	英漢字典	iOS, Android, Mac, Windows	Mobile devices or PCs	No	Free with advertisements	

c. Data collection instruments

(1) Online questionnaire

This study distributed an online questionnaire to the participants via the *Qualtrics* platform. This instrument was designed based on Davis's (1993) TAM and Sharples' (2009) evaluation of mobile technology. It aimed to explore participants' (1) perceived ease of use, (2) perceived usefulness, and (3) behavioural intention to use the three types of MDs. Specifically, perceived ease of use relates to how easy the learners believe the MDs are to use; usefulness refers to how effective the learners perceive the MDs to be; and behavioural intention to use relates to learners' willingness to use the MD in the future.

The questionnaire contained five demographic questions, 15 closed multiple-choice questions that targeted participants' acceptance and one open-ended question to collect additional comments (see Appendix B). The main body of the questionnaire used a five-point Likert scale to describe the divergent degrees of acceptance of each concept: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree and 5 = Strongly agree.

(2) Semi-structured group interviews

The semi-structured group interviews in this study aimed to explore the reasons underlying the participants' acceptance of the MDs and to allow learners' varied and complementary opinions to be brought together. The interview encouraged interviewees to express their views using their own terms in Chinese. It was relatively flexible in content and format. In line with the questionnaire, questions about the three key themes were posed. Appendix C shows the detailed group interview plan.

c. Data analysis

Descriptive and statistical analyses of the questionnaire data were conducted using *SPSS* (version 26.0). Although treating ordinal data as interval data is controversial (Jamieson, 2004), an increasing number of scholars (e.g., Harwell & Gatti, 2001) have argued that it should be acceptable in educational research. As analysing ordinal data as interval data might be much easier to interpret with more information than non-parametric alternatives (Coakes & Steed, 2009), we decided to rescale the ordinal

data to an interval scale. The five-point Likert scale data were imported into *SPSS 26.0* to calculate the average rating for each question. In addition to the descriptive analysis, one-way analysis of variance (ANOVA) and one-way multivariate analysis of variance (MANOVA) were run to examine the possible differences among the three MD groups.

For the group interviews, the qualitative data were coded and analysed using *MAXQDA Plus.* We followed Braun and Clarke's (2006) seven stages of thematic analysis to explore the patterns within the data. As the qualitative data were highly personalised, we conducted open coding, an efficient method for initially labelling and categorising chunks of data (Rivas, 2012). We descriptively labelled the data as "units of meaning" to obtain the initial codes (Miles & Huberman, 1994, p.56). Subsequently, we grouped these codes and iteratively reorganised them under the three main themes (i.e., perceived ease of use, perceived usefulness, and behavioural intention to use the three MDs) in the questionnaire. For example, *"The dictionary uses dark blue and black colours for the important information, which helps me concentrate on the content"* was coded as a positive response about colour, which was then categorised into the theme of "ease of use". The final analytical framework for the interview data is shown in Appendix D.

d. Reliability and validity

(1) Reliability

To maximise reliability, rigour, consistency and trustworthiness (Wiersma & Jurs, 2005), the questionnaire's design and findings were reviewed by the teachers of the participating students at the target universities. Furthermore, an independent coder specialising in L2 education and educational technology was invited to code 20% of the data to check and review the consistent use of codes, the clarity of the data allocation, and the categories and themes (Thomas, 2006). The inter-coder agreement was 89%, which is considered acceptable with relatively high inter-rater reliability (Riazi, 2016). We rechecked the codes where disagreements arose and discussed these with the independent coder. We also reviewed relevant literature and previous practices, and even spoke to the participants to clarify some confusion and make final refinements.

Internal consistency, described as the homogeneity of reliability (Cohen et al., 2017), was checked and found to be relatively high, as determined by Cronbach's alpha of 0.850. To maximise external reliability and replicability, we made the research rationale, aims, sampling, design and data collection/analysis approaches as straightforward as possible.

(2) Validity

Triangulation of the quantitative and qualitative questionnaire and interview data addressed the issue of internal validity (O'Leary, 2014, p. 132). Recruitment of participants at the intermediate English language proficiency level, who are considered to comprise the majority of Chinese university students, helped to maximise external validity.

Principal component analysis (PCA) was run on the 22 closed questions in the questionnaire to test its construct validity. The KMO measure was 0.848, with individual KMO measures all greater than 0.7 and classifications of middling to meritorious (Kaiser, 1974). Bartlett's test of sphericity was statistically significant ($p < .001$), indicating that the data were likely to be factorisable. According to

the PCA, the questions in the questionnaire could legitimately be categorised into the three main constructs in the TAM, and the three-component solution met the interpretability criterion. This explained 66.91% of the total variance. The PCA verified the construct validity of the questionnaire. The three main components are (see Appendix E for details):

Component 1 – Perceived usefulness
Component 2 – Perceived ease of use
Component 3 – Behavioural intention to use

5. Findings

a. Theme 1 Perceived ease of use

To explore this theme, six questionnaire items were designed, respectively covering whether (1) the MD instructions are clear; (2) the instructions are helpful; (3) the colour is appropriate; (4) the font is appropriate; (5) the layout is appropriate; and (6) the information can be easily found. The mean Likert scale ratings of these six aspects of ease of use are all between 3 to 4. Descriptive data are shown in Table 2.

Commented [SH4]: Why is this changed since the questionnaire says "useful"?

Table 2 Overall mean ratings and standard deviations of perceived ease of use items

Item		M	SD
1	Clear instructions	3.62	.89
2	Useful instructions	3.75	.75
3	Appropriate colour	3.20	.80
4	Appropriate font	3.68	.66
5	Appropriate layout	3.62	.78
6	Information access	3.33	.81

Comparing the three MD groups, results show that participants in the bilingualised group were more satisfied with the perceived ease of use, while the bilingual MD group had the lowest mean ratings (Table 3). Results of the one-way MANOVA reveal *statistically significant differences* in Items 1, 5 and 6, $p < .05$ (Table 4). The Tukey post-hoc test results show *significant differences* between the bilingualised and the bilingual group ratings on the three items, $p = .011, .023, .019$ (Table 5). The effect sizes (Cohen's *d*) are .70 (medium), .97 (large), and .66 (medium).

Table 3 Mean ratings and standard deviations of perceived ease of use by MD group

Item		Monolingual		Bilingualised		Bilingual	
		M	SD	M	SD	M	SD
1	Clear instructions	3.64	.85	3.93	.90	3.29	.92
2	Useful instructions	3.76	.77	3.87	.75	3.62	.76
3	Appropriate colour	3.79	.78	3.85	.81	3.68	.80
4	Appropriate font	3.67	.68	3.80	.69	3.58	.64
5	Appropriate layout	3.79	.80	3.91	.78	3.16	.77
6	Information access	3.44	.80	3.55	.84	3.00	.82

Table 4 MANOVA results: Between-Subjects Effects of perceived ease of use, by MD group

Dependent Variable		df	F	Sig. (2-tailed)	Partial Eta Squared
1	Clear instructions	2	4.888	**.013**	.069
2	Useful instructions	2	4.452	.068	.061
3	Appropriate colour	2	4.276	.078	.058
4	Appropriate font	2	4.385	.061	.053
5	Appropriate layout	2	3.569	**.026**	.051
6	Information access	2	3.127	**.015**	.049

Table 5 Tukey post-hoc test results of perceived ease of use, by MD group

Dependent Variable	(I) MD	(J) MD		(J) MD	
		Mean difference	Sig.	Mean difference	Sig.
Clear instructions		Monolingual		Bilingualised	
	Bilingualised	.38	.135	/	/
	Bilingual	-.19	.596	-.57*	**.011**
Appropriate layout		Monolingual		Bilingualised	
	Bilingualised	.27	.678	/	/
	Bilingual	-.20	.352	-.61*	**.009**
Information access		Monolingual		Bilingualised	
	Bilingualised	.22	.202	/	/
	Bilingual	-.28	.254	-.59*	**.023**

Some findings and quotes from the interviews are provided next in order to illustrate the findings in more contextual detail. Regarding instructions (Items 1 and 2), participants in the bilingualised group, like Yuan (Interview 9), highlighted that the navigation bars at the left-hand side and at the bottom of the page attracted his attention and guided him to find the information he required. By contrast, participants in the bilingual group criticised the lack of instructions in this type of MD.

For colour and font (Items 3 and 4), the interview responses from the three groups all indicated that the colour and font are generally deemed appropriate. In particular, some responses in the bilingualised group described how the colour and font make the users feel that the dictionary is intuitive. For example, one participant showed us the user interface (Figure 2) and said:

> Unlike other dictionaries, I like the colour and font of this mobile dictionary. The dictionary uses dark blue and black colours for important information, which helps me concentrate on the content. The example sentences, which are not as crucial as the definitions from my perspective, are shown in light brown. Apart from that, the target words are presented in bold with a large font, and the titles of each aspect are capitalised, which are clear. (Wang, Interview 13)

For Items 5 and 6 (layout and accessibility), participants in the monolingual group were generally satisfied with the clear and concise layout. In the bilingualised group, participants spoke positively about the presentation of information in the dictionary, which they perceived as clear and well-structured. For example, differing from other MDs that list all example sentences together in a separate section, Ding (Interview 11) mentioned that the example sentences in this MD are located under the corresponding definition, so users can understand how to use a word in different contexts after reading its definition. She showed us the screen in Figure 3, which presents the two example sentences below the word definition. In this case, learners can see the definition of this word and find out how to use it in a specific context.

Figure 3 A screenshot of the bilingualised MD

As participants mentioned, this MD includes hyperlinks, making the user interface clear and enabling users to find the information that they need quickly. As Figure 3 illustrates, users can click the hyperlinks (e.g., the image of the word, frequency, thesaurus, grammar) based on their needs to reveal and then refer to more information.

Figure 4 A screenshot of the hyperlinks in the bilingualised MD

Participants mentioned that the bilingual MD is very concise, clearly presenting the Chinese translations of the word with a few example sentences. Therefore, they reported it is efficient for discovering word meanings when completing timed reading comprehension activities like skimming tasks. Nevertheless, many participants still suggested that this MD could be more structured. They thought this could be achieved by categorising the information into different aspects. They also advised adding more hyperlinks to the MD to make it clearer.

b. Theme 2 Perceived usefulness

(1) Reading

Participants were asked to indicate whether they perceived that the MD could help them read faster and better understand their reading tasks, again using a 5-point Likert scale. Generally speaking, participants' acceptance of the effectiveness of the MDs was neutral. Table 6 displays the descriptive results. Results of one-way MANOVA show no significant difference between the MD groups, F (4, 242) = .876, p = .479; Wilks' Λ = .972; partial $\eta 2$ = .014.

Table 6 Learners' perceived effectiveness of MDs in reading

MD Group	Reading speed		Reading comprehension	
	Mean	SD	Mean	SD
Monolingual	3.21	.73	3.53	.82
Bilingualised	3.23	.84	3.79	.80
Bilingual	3.20	.75	3.50	.83
Overall	3.22	.76	3.65	.81

In the interview, when the participants were asked whether using MDs could help them increase their

reading speed, their responses varied. The "positive" group identified two situations in which using MDs can expedite their reading process: (1) when an article has too many unknown words and (2) when the unknown words are crucial to answering the reading comprehension questions. Some examples follow.

Situation 1: When the article has too many unknown words

> If there are many unknown words in one short paragraph, it is tough for me to understand the whole paragraph. In this case, seeking help from dictionaries is necessary. If I ignore these words and continue my reading, I have to go back to reread the paragraph, which will take more time. (Rong, Interview 4)

Situation 2: When the unknown words are crucial to answering the reading comprehension questions

> The reading tasks aim to answer the questions correctly. If the unknown word is in the question, or it's crucial for understanding it, I will use the dictionary rather than hesitating and spending lots of time guessing. (Han, Interview 11)

In contrast, the "negative" participants reiterated that using MDs interrupted their reading process and is too time-consuming. Instead, participants like Heng (Interview 5) reported that she is predisposed to carry out non-academic tasks on her mobile device, such as replying to text messages and checking updates on social media. As Heng highlighted, her teachers did not recommend using MDs because of the prohibition of using such tools and mobile devices during exams.

Regarding **reading comprehension**, participants' positive responses related to the quantity and quality of the content. In terms of quantity, participants agreed that MDs provide users with rich information. Cao (Interview 14) exemplified the belief that the bilingualised MD used in this study contains various authentic example sentences, phrases and idioms. She preferred to read this information to understand the unknown words in different contexts. Regarding quality, participants (e.g., Gu, Interview 16) were satisfied with the high quality of MDs. These participants acknowledged that the bilingualised MD, created by an authoritative publisher, is trustworthy. The high-quality information in the MD could help them to clarify unknown words in the reading tasks and comprehend the text relatively smoothly.

Participants with negative attitudes complained that even when they knew all the meanings of a particular word, they sometimes could not understand it in the text. From their perspective, MDs are only useful for acquiring denotative rather than connotative meanings. For example, according to Dong:

> I remember I didn't know the word "swathe" in a reading. After checking the dictionary, I knew this word means *"a long strip of land, especially one on which the plants or crops have been cut",* but I was still unable to understand the phrase "great swathes of science textbooks". I think understanding a word's meaning and its use is different. (Dong, Interview 6)

(2) Vocabulary learning

Learners' perceived usefulness of MDs in vocabulary learning refers to their perspectives on spelling,

meaning, word use, part of speech (POS), pronunciation and other aspects of vocabulary knowledge. According to Table 7, the participants held the most positive attitudes concerning using MDs for learning word meaning, POS, pronunciation and spelling ($M > 4.00$). Participants in the bilingualised group were more favourable than those in the other two groups, while the bilingual group was the most negative. The one-way MANOVA showed *significant differences* between the three MD groups, F (12, 234) = 1.885, p = .037, Wilks' Λ = .831, partial η^2 = .088. Moreover, a Between-Subjects Effects test was conducted, and the results demonstrate *significant differences* in word use, POS and other aspects of vocabulary knowledge, p = .038, .009 and .001, respectively (Table 8).

Table 7 Learners' perceived effectiveness of MDs in vocabulary learning

MD Group	Spelling		Meaning		Use		POS		Pronunciation		Other aspects	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Monolingual	4.04	1.02	4.26	.97	3.69	.77	4.16	1.15	4.13	.99	3.33	1.02
Bilingualised	4.16	.80	4.51	.75	3.98	.81	4.58	.85	4.37	.87	3.67	.88
Bilingual	3.98	.76	4.10	.74	3.43	.79	4.10	.82	3.98	.87	2.81	.89
Overall	4.06	.86	4.29	.82	3.70	.79	4.28	.94	4.16	.91	3.27	.93

Table 8 MANOVA results: Between-Subjects Effects of the usefulness of MDs in vocabulary learning, by MD group

Dependent Variable	df	F	Sig.	Partial Eta Squared
Spelling	2	.446	.641	.007
Meaning	2	2.677	.073	.042
Word use	2	3.368	**.038**	.052
POS	2	4.881	**.009**	.074
Pronunciation	2	2.322	.102	.037
Other aspects	2	7.732	**.001**	.112

A Tukey post-hoc test was run to explore the differences between every pair on each measure (Table 9). Results show that there were *statistically significant differences* between the bilingualised and the bilingual groups in **word use**, p = .028, Cohen's d = .69 (medium effect size). For **POS**, *significant differences* were found between the monolingual and bilingualised groups, p = .036, Cohen's d = .27 (small effect size), and the bilingualised and bilingual groups, p = .014, Cohen's d = .57 (medium effect size). Regarding **other aspects** of vocabulary knowledge, there were *statistically significant differences* between the bilingualised and bilingual groups, $p < .001$, Cohen's d = .97 (large effect size).

Table 9 Tukey post-hoc test results of the usefulness of MDs in word use, POS and other aspects, by MD group

Dependent Variable	(I) MD	(J) MD		(J) MD	
		Mean	Sig.	Mean	Sig.

		difference		difference	
Word use		Monolingual		Bilingualised	
	Bilingualised	.28	.401	/	/
	Bilingual	-.27	.420	-.55*	**.028**
POS		Monolingual		Bilingualised	
	Bilingualised	.43*	**.036**	/	/
	Bilingual	-.05	.947	-.49*	**.014**
Other aspects		Monolingual		Bilingualised	
	Bilingualised	.35	.267	/	/
	Bilingual	-.52	.061	-.86*	**.000**

In the interviews, participants' responses identified three aspects of MD use: (1) the *design* of MDs, (2) the *content* of MDs and (3) learners' MD use *habits*. Specifically, participants who agreed MDs could benefit their **spelling** highlighted the *design* of MDs, especially their user interfaces. Participants from the monolingual group mentioned that the relevant information quickly caught their attention when they read the word entry, as the words are in bold in a large font (see Wang's response in Interview 13 above). In contrast, participants with negative attitudes pointed out that because they did not pay much attention to the spelling of a word when they searched for it in MDs (relating to *habits*), they were unlikely to remember how a word was spelt.

All responses concerning word **meaning** related to the *content* of MDs. "Positive" participants argued that using MDs could help them understand words. The monolingual and bilingualised MDs, in particular, offer semantic and pragmatic information. For example, as Rong said:

> When I only read the definitions or the Chinese translations of a word, sometimes I still feel confused about the context in which this word can be used. I like the example sentences in the dictionary that provide information about the word's use in authentic contexts. (Rong, Interview 2)

However, the "negative" participants complained that the definitions in the monolingual and bilingualised MDs are to some extent excessive, which may create a large cognitive burden and tiredness. Some participants also criticised the bilingual MD for lacking authentic and contextual information.

In terms of word **use**, on the one side, the "positive" participants who used the monolingual and bilingualised MDs explained that MDs enable them to understand how to use words via various methods (relating to *content*), including (1) example sentences, (2) synonyms and antonyms, (3) affixes, and (4) collocations. Conversely, "negative" participants complained that collocations are sometimes absent from the bilingual MD (relating to *content*). Moreover, these participants stated that the information in MDs only gives them a shallow impression of certain words, familiarising them with their meanings at just a receptive level.

Participants' positive responses about **POS** show that MDs could help them understand words with multiple POS (relating to *content*). For example, Dong (Interview 6) noted that she knew that the

word “nibble” is a noun before the study but did not know it could also be a verb. During reading, she used MDs to look up the word and familiarised herself with it as a verb. Some participants pointed out that the example sentences are good resources for discovering POS. Nevertheless, some “negative” participants complained that the POS section of the word entry is difficult to find and has a very small font (relating to *design*). As a result, they sometimes did not notice this aspect, especially when undertaking a timed task.

Regarding **pronunciation**, “positive” participants in the three groups all explained that they liked the phonetic symbols clearly shown in the word entry (relating to *design*), which are usually close to the target word. However, the human pronunciation tool is not perfect. Some “negative” participants mentioned that a few words are marked with the wrong pronunciation and that some words only have either American or British pronunciation, which meant they could not meet their needs to learn both accents (relating to *content*).

The benefits of MDs in learning **other aspects of vocabulary knowledge** (e.g., synonyms and antonyms) were also mentioned by “positive” participants. For example, Wen (Interview 15) identified that the monolingual and bilingualised MDs mark synonyms as “SYN” and antonyms as “OPP”, which attracted her attention and helped her to remember these aspects (relating to *design*). In contrast, some “negative” participants in the bilingual group pointed out that some words’ synonyms, antonyms, registers, derivatives and grammatical functions are absent (relating to *content*).

c. Theme 3 Behavioural intention to use

Regarding learners’ decisions about using the MD in the future, the mean rating was 3.33, demonstrating neutral feelings: neither highly positive nor highly negative. Among the three MD groups, the bilingualised group indicated a stronger willingness (M = 3.70, SD = .90) than the monolingual and bilingual groups (monolingual: M = 3.28, SD = .92; bilingual: M = 3.00, SD = .88). A one-way ANOVA test demonstrated a *significant difference,* p = .022. The Tukey post-hoc test results indicated *significant differences* between the bilingualised and the bilingual group, p = .008 (Table 10). The effect size (Cohen’s d) is .80, which is large.

Table 10 Tukey post-hoc test results of learners’ behavioural intention to use MDs, by MD group

Dependent Variable	(I) MD	(J) MD		(J) MD	
		Mean difference	Sig.	Mean difference	Sig.
Future use		Monolingual		Bilingualised	
	Bilingualised	.42	.165	/	/
	Bilingual	-.27	.465	-.70*	**.008**

Participants’ interview responses indicated that they had different preferences regarding their future use of MDs. In the monolingual and bilingualised groups, participants who reported continuing to use MDs in the future were satisfied with the *content* and *design*. As they explained, these two MDs were well-designed and user-friendly, and the content was accurate, rich and authentic. In the bilingual group, the main reason participants were willing to use the MD predominantly pertained to its concise

design, which meant they could quickly find word meanings.

Nevertheless, over 20% of participants (n = 28) mentioned they would not use the MD in the future. In the monolingual group, some participants complained that reading and understanding English information took too much time. The bilingualised group sometimes felt overloaded by reading the information in both English and Chinese. Many stated they would not use the bilingual MD because of the simplistic Chinese translations. In the interviews, participants shared other mobile-assisted English learning resources they planned to use in the future (Appendix F). Their different choices, to a large extent, indicate the personalisation of Chinese EFL learners' selection of MALL resources.

6. Discussion

The present study corroborates the TAM as applied to MDs, demonstrating that learners' perceived ease of use, perceived usefulness and behavioural intention to use are consistent. Participants in the bilingualised group held more positive perceptions than the other two groups in all three aspects, while the bilingual MD received the least positive evaluations from the participants. The results are in line with the previous studies on the acceptance of various related technologies (e.g., online language learning system: Wang et al., 2022; mobile learning: Park et al., 2011; PDAs: Chang et al., 2012; mobile dictionaries: Chan, 2010), as well as the studies demonstrating learners' preference of bilingualised dictionaries (e.g., Shi & Chen, 2005). Nevertheless, it should be noted that the results in this study are not consistent with some studies mentioned in the literature review (e.g., Ma, 2019; Nation & Webb, 2011; Thienthong, 2020), as these studies all verified that the bilingual dictionary is the most *widely-used* dictionary type among language learners. Thus, we could argue that there is a potential disjuncture between (1) what lexicographers intend to offer learners, (2) what learners perceive, and (3) what they actually use (Levy & Steel, 2015). The possible reasons for the disjuncture in the present study may be that the bilingualised dictionary is the only one that requires payment, so it would be avoided by many learners in favour of free ones that might not have quite the same level of functionality or usability. Besides, the learners may also expect that a MD that carries a charge might be better quality than one that is free.

Although previous studies empirically verified the effects of external variables on learners' acceptance of technology (e.g., Alfadda & Mehdi, 2021; Barrett et al., 2020; Liu et al., 2010), the variables may vary in different learning contexts. In this case, it is necessary to remain open to exploring the factors that impact user acceptance in differing language learning scenarios. In this study, we predominantly draw on the original TAM and consider the variables in TAM 2/3 and previous studies to generate a comprehensive picture of Chinese learners' acceptance of MDs in English language learning.

In terms of internal factors, learners' awareness of their language limitations and reference needs is vital. As Frankenberg-Garcia (2011) and Laufer (2011) argued, regardless of how well dictionaries are designed or the amount of useful information they contain, they cannot be helpful if learners do not feel that words need to be looked up. In the interviews conducted in the present study, many participants shared that when unknown words are crucial to completing a reading comprehension task, they will use MDs for reference and with a positive attitude. This phenomenon verifies that learners' awareness of reference needs contributes to their positive perceptions and use of MDs.

Externally, from a sociocultural perspective, learners' acceptance may also be impacted by the views of other influential individuals about whether technology should/should not be used in that particular sociocultural learning community (Wang et al., 2022). This relates to "subject norm", which refers to a person's attitudes towards other people around them who are important to them and their views about whether they should/should not perform the behaviour in question (Fishbein & Ajzen, 1975). At the micro level, teachers, as Boonmoh (2010) and Hojatpanah and Dashtestani (2020) highlight, play vital roles in motivating EFL learners to accept and use technologies in their language learning. In this study, some participants mentioned that their teachers do not allow them to rely overly on dictionaries because they are banned during various exams. Besides, some teachers complained quite negatively that dictionaries, including electronic dictionaries and MDs, were inaccurate, noisy and distracting (Stirling, 2005). In Midlane's (2005) research, only 11% of teachers stated they had actively encouraged their students to bring EDs to class and use them, and only 33% stated that they might try to exploit students' initiative in the future. When such prejudice against dictionaries is present, teachers may suggest to their students that they treat the dictionary as a tool of last resort. Alternatively, they preferred to use a simple vocabulary list and attempted to encourage their students to guess the word meaning from the context (Tono, 2001). However, we should acknowledge that recently the quality of dictionaries has significantly improved as lexicographers and educators have made efforts to develop higher-quality dictionaries (including MDs). More studies on teachers' attitudes toward dictionaries should be conducted.

Other relevant factors that may also impact learners' acceptance are government policy and culture. In China, for example, there are three levels of requirements for measuring English language learning outcomes in the *College English Curriculum Requirements*. However, dictionaries are only regarded as a reference tool for improving learners' translation skills rather than a language learning tool. For instance, for translation skills at the beginning level, the requirements require students to translate essays on familiar topics from English into Chinese and vice versa with the help of dictionaries (Ministry of Education, People's Republic of China, 2007), rather than integrating dictionaries into English language teaching and learning.

At the macro level, the exam-oriented culture which prevails cannot be overlooked. Examination in China has been the predominant way of selecting talent and entering the elite society. The exam-oriented culture intensifies the importance of exams in obtaining further education opportunities, jobs and more prestigious lifestyles (Guo et al., 2019; Pan & Block, 2011). In this study, students explained that the closed-book exams that do not allow them to use referential materials negatively impact their acceptance of dictionaries. Gaokao, the most important standardised exam for entrance into almost all higher education institutions, and other English language tests (e.g., TEM-4/8[1], CET-4/6[2]), are closed-book exams. Against this backdrop, learners must work intensively to prepare for the competitive exam by doing many exercises and mock tests around the clock without any references. Therefore, their acceptance of MDs may be affected.

To summarise, many factors (i.e., learners, teachers, government policy, culture) influence Chinese university EFL learners' acceptance of MDs. In this case, to use MDs better in future English language

[1] TEM-4/8: Test for English Majors Band 4/8

[2] CET-4/6: College English Test Band 4/6

teaching and learning, we should take account of all these possible factors to holistically understand the complexity of MDs and the MALL environment.

7. Conclusion

Chinese university-level EFL learners are now expected to be more responsible for their self-regulated vocabulary learning in the digital era. MDs, which serve as a reference and language learning resource, create increasing opportunities for learners to search for unknown words and to acquire these words when undertaking other language learning activities. The present study gained an understanding of Chinese university EFL learners' acceptance of this type of mobile-based application. In this study, students evaluated the assigned monolingual, bilingualised and bilingual MDs. The results show that participants in the bilingualised MD group generally exhibited more positive attitudes among the three MD groups – especially compared with the bilingual MD group, where significant differences emerged. In particular, regarding perceived ease of use, they thought the bilingualised MD had more precise instructions and a more appropriate layout, which helped them easily access information. In terms of usefulness, their acceptance of the bilingualised MD in acquiring word use, POS and other aspects of vocabulary knowledge was significantly higher than their counterparts who used the bilingual MD. Regarding their behavioural intention to use MDs, the bilingualised group also reported firmer intentions to continue to use the bilingualised MD in the future.

Theoretically, the results have verified the TAM, indicating the consistency between perceived ease of use of MDs, perceived usefulness and behavioural intention to use. What is more, various factors that impact EFL learners' acceptance from the perspectives of learners themselves, teachers, curriculum and government policy, and culture in the sociocultural context, have been explored. The study's analysis indicates that understanding learners' acceptance of MALL applications is complex, multilevel and multifaceted. Practically, as the advantages of bilingualised MDs have been underscored both in terms of ease of use and usefulness, developers of the other two types of MDs should seek to upgrade their products with more user-friendly operating systems and enhanced learning functions. In the information age, new technologies such as natural language processing, augmented reality, virtual reality, and artificial intelligence offer possibilities for creating more personalised, adaptative and interactive language learning environments. MD developers and researchers should consider designing more intelligent and adaptive tools based on learners' needs. It is expected that more attractive features, such as intelligent tutoring and instant feedback, could be added to MDs to support future L2 learning.

Nevertheless, it should be acknowledged that the results of the present study could only be generalised to Chinese EFL learners or other learners in similar language learning contexts. The generalisability could be further developed when more educational contexts are researched. Given the complexity of MALL in different sociocultural learning contexts, future studies could collect data from other stakeholders (e.g., teachers, school leaders, curriculum designers, and policymakers) apart from the learner data (i.e., self-report questionnaire and interview) to triangulate the research findings.

Acknowledgements

We would like to thank the students who kindly donated their time to participate in our study and our colleague who contributed to the inter-coder reliability exercise. We are also grateful to the anonymous peer reviewers for their helpful comments on an earlier draft.

Disclosure statement

There is no potential conflict of interest.

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