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Effects of Mobile-Assisted Language Learning on Young Learners' Linguistic Skills

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Mobile-assisted language learning (MALL) has been regarded as an excellent tool in the field of language acquisition as modern technology develops. The popularity of using mobile devices in education makes it possible for people to learn languages through platforms like tablets and smartphones from anywhere and at any time. However, the application of MALL in a collaborative student-centered environment has received comparatively little attention. Since spoken fluency and vocabulary size are the two crucial components of language proficiency, this study aims to investigate if young learners can improve their native language level through learning online beyond the classroom. The quantitative data reveal that MALL does make a difference in students' linguistic skills. The results show that the incorporation of mobile applications into language learning could better help learners achieve the learning outcomes and improve their communication skills than simply using conventional methods. In addition, the data of the questionnaire exposed some issues that need to be continuously improved. The viable suggestions are also discussed to share ideas about building a more sustainable learning environment in a data-driven age.

Keywords: mobile-assisted language learning, young learners, linguistic skills

Introduction

Chinese conventional classrooms frequently retain a restrictive disciplined atmosphere, where the teacher establishes certain guidelines that the students are supposed to abide by (Chan, 1999). The importance of obedience, respect for authority, and adherence to a hierarchical structure are emphasized in the classroom (Curdt-Christiansen, 2020), in which the teacher is seen as the core of education and conveys knowledge to the students. An obvious drawback of China's traditional teaching approach is the fossilization of language acquisition (Wei, 2008). Most pupils simply learn and memorize tedious grammar and plentiful words mechanically by rote without any comprehension in order to cope with the huge burden of heavy homework. This approach causes learners to lose confidence and passion for language learning over time since it requires much time and focus and also breeds impatience and indifference. Additionally, the traditional teaching strategy

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also gives students little opportunity to participate in class, focusing instead on grammatical competence and explicit understanding of language norms, despite the fact that participation is an important component of evaluating students' learning results and their application potential (Ellis, 2001; Bunch, 2013). In this way, students pay much attention to getting high exam scores while ignoring the practical application of the target language. As a result, many students find it difficult to use the language in a communicative way, such as exchanging information, sharing thoughts and sentiments, etc. (Adair-Hauck & Donato, 2002).

To explore an effective way to enhance pupils' language proficiency, a great amount of research has been conducted, among which online education through mobile devices is receiving more attention. Mobile-assisted language learning (MALL) has been proven to enhance interactions and communications between teachers and students (Shortt et al., 2021). Specifically, MALL refers to a new learning strategy using mobile devices as tools for communication and interaction of language learning (Katemba, 2021). Previous studies have highlighted that this online education has priorities on language acquisition by the following four main advantages. Firstly, it allows the removal of time and place restrictions, enabling students to access learning resources at any time and from any location (Singh, O'Donoghue, & Worton, 2005). Secondly, it increases interaction, teamwork, and contact in real-world situations for language acquisition across educational contexts (Godwin-Jones, 2019). Thirdly, it makes language learning possible to take place in a variety of contexts and offers a platform for practice in interpersonal learning (Gacs, Goertler, & Spasova, 2020), thanks to the advantages of mobile devices with multimedia capabilities. Fourthly, it gives language learners the ability to manage their learning according to their preferences and real-world requirements (Molderez & Fonseca, 2018).

As noted in the previous studies, the student-centered approach and the scaffolding strategy play an indispensable role in language learning, as they are crucial for fostering cooperation and communication skills, which in turn improve critical thinking abilities and foster engagement and collaboration. However, most studies of these two frameworks mainly focus on the face-to-face classroom situation, yet applying them in an online learning environment remains to be further explored. The current study intends to investigate the impacts of MALL on vocabulary size and language fluency through the use of the app Dingding to address this topic based on the two theoretical frameworks, the student-centered approach and the scaffolding theory. Additionally, it is anticipated to shed light on the learning of the first language in Chinese primary schools and demonstrate the benefits of MALL outside of the classroom.

Literature Review

Mobile-Assisted Language Learning

With the development of information technology, MALL has emerged as a potential tool to explore a new teaching method for its possibility of creating a multifunctional and ubiquitous learning environment (Burston, 2014). Being distinctive from traditional teaching, it reveals the removal of time and place restrictions, enabling students to access learning resources at any time and from any location (Duman, Orhon, & Gedik, 2014). It also offers the potential to enhance language learning by providing students with individualized, real-world, and contextualized learning experiences using mobile devices like smartphones and tablets as the media (Chinnery, 2006).

Previous studies noted that the portability and flexibility of mobile devices can be customized to meet learners' needs to develop the language level at their own pace both in the classroom and in outdoor informal learning (Goundar, 2011; Sung, Chang, & Yang, 2015), which furthermore lead to the development of self-

awareness and self-regulated learning (SRL) skills (Zimmerman, 2002). During the SRL process, these skills are crucial components of academic success and have influences on sustainable learning (Guo, Zhang, & Wu, 2022). In addition, users with mobile devices can easily collaborate, share information, and meaningfully interact with others. Numerous studies indicate that participant interaction, whether it is between participants or between participants and the teacher, is one of the best indications of good outcomes in online learning environments (Arbaugh & Benbunan-Fich, 2007). Furthermore, researchers have also discovered how effectively mobile devices are used in diverse contexts for language learning and development and have come to the conclusion that, when used appropriately, mobile technology will advance linguistic development (Lin et al., 2019). In other words, mobile devices with multimedia capabilities make it possible for language learning to take place in a variety of contexts and offer a platform for practice in interpersonal learning (Li, Fan, & Wang, 2022). Specifically, mobile-assisted vocabulary acquisition has become one of the most significant methods of language learning due to the scientific management of time and the variety of learning materials. Dale's cone of experience shows that the more learners participate in activities and express their ideas, the more knowledge they will acquire, including vocabulary learning (Davis & Summers, 2015). Therefore, it is applicable to use mobile devices as platforms to learn vocabulary and to understand their meaning in the context (Govindasamy, Yunus, & Hashim, 2019).

Notwithstanding the proven advantages supported by various studies, MALL also presents certain drawbacks and obstacles, including the constraints of small screens, connectivity issues, and limitations in audiovisual quality (Chinnery, 2006). The compact size of mobile screens may restrict the amount of content that can be displayed simultaneously, potentially causing difficulties in reading or viewing multimedia materials. This limitation can also affect the overall user experience, making it less engaging and potentially straining learners' eyes (Kerawalla, Luckin, Seljeflot, & Woolard, 2006). Mobile devices heavily depend on internet connectivity for accessing online learning resources, such as language learning apps, websites, or video streaming platforms (Miangah & Nezarat, 2012). Connectivity problems, such as slow or intermittent internet access, can disrupt the learning process, making it challenging to access or load the necessary learning materials (Octaberlina & Muslimin, 2020). Learners may face frustration and interruptions in their learning progress due to these connectivity issues. Furthermore, mobile devices may have limitations in terms of audio and video quality, particularly in older or budget-friendly models (Jandee et al., 2014). This limitation can affect language learning activities that require clear audio input, such as listening to pronunciation or dialogues, and insufficient audio quality can hinder learners' ability to effectively comprehend and practice spoken language skills (Al-Shamsi, Al-Mekhlafi, Busaidi, & Hilal, 2020).

Peer and Adults Scaffolding

Aimed to increase learners' motivation, ease activities' complexity, and lessen students' frustration, scaffolding in the pedagogical practice can be described as the guiding role of adults' assistance or peers' collaboration in children's development of learning. The premise behind scaffolding is that by providing students with the appropriate level of assistance at the appropriate moment, they can learn more successfully. From a Vygotskian view, the core of scaffolding is socio-cultural psychology and the notion of the zone of proximal development (ZPD) (Shabani, Khatib, & Ebadi, 2010). The ZPD describes the gap between a student's current level of knowledge and their potential level of knowledge with assistance from a more knowledgeable person. In other words, the ZPD is the difference between a student's performance and what they can achieve with the direction and assistance of a teacher or a more experienced peer. This suggests that the process of learning is not

merely an individual process but also highly influenced by social and cultural influences. As a result, transferring the responsibility from the teacher to the students, scaffolding is an essential strategy to help students cross the ZPD and gradually decrease the support as the student becomes more competent and independent since assistance among peers in a collaborative learning environment and interaction between peers helps re-construct knowledge (Guo et al., 2022). With the application of technology, scaffolding can be achieved online in education, referring to the use of digital tools and resources to support students' learning and help them achieve their objectives (Brush & Saye, 2002). Technology-based scaffolding is typically accomplished through the online discussion forum, which is an essential part of online courses (Marra, Moore, & Klimczak, 2004). Compared with face-to-face communication, discussions that occur over mobile devices are more task-based and explicit about individual expectations. Students are better able to build higher-order skills like critical thinking and problem-solving abilities through interactions in group activities between students as well as between students and teachers. For example, according to Choi, Land, and Turgeon (2005), in a scaffolding peer-questioning group activity, learners may try to uphold their arguments or go back to their initial understanding when they encounter opposing viewpoints or specific queries about their explanations from peers. Several viewpoints may therefore aid students in recognizing discrepancies in their understandings and spotting holes in their explanations. As students identify their knowledge gaps, they could actively look for new materials to fill them.

Student-Centered Approach

By transferring the duties of collecting, evaluating, and summarizing knowledge from the teacher to the learner, student-centered pedagogies are intended to offer students the chance to participate more actively in the study instead of passively receiving and processing information (Lee & Hannafin, 2016). These settings enable students to investigate complicated issues utilizing a range of resources, create their own approaches to solving these issues, and then present and look for remedies for these problems in a group setting. According to D. W. Johnson and R. T. Johnson (2009), as an important implementation of the student-centered mode, cooperation learning results in higher achievement, stronger motivation, and greater self-esteem and confidence. Additionally, student-centered strategies outside of the classroom are meant to support students in three ways: (a) taking responsibility for the learning process and achieving personally relevant learning goals; (b) fostering independent learning through procedural, conceptual, and strategic scaffolding; and (c) learning autonomously (Lee & Hannafin, 2016).

In online teaching, the student-centered approach is even more important as it can help to mitigate the potential challenges of distance and isolation. The web-based online-learning environment can be described as an intentionally portrayed and planned area for educational interactions, in which students participate actively and behave as actors in the virtual space (Mystakidis, Berki, & Valtanen, 2021). Correspondingly, Hannafin and Land (2000) argued that the fundamental tenets of a student-centered online learning environment should consist of the following: (a) the learner's centrality in defining meaning (i.e., learner autonomy and active learning); (b) the significance of situated thinking and authentic contexts; (c) the learners' and instructors' competence with technology, etc. In this mode, students had a better chance to learn general language skills through this actual interaction and to use those skills to communicate and create new information utilizing new technologies.

Incidental Vocabulary Learning

Incidental vocabulary learning refers to the acquisition of new words and their meanings as a byproduct of engaging in activities that do not have explicit vocabulary instruction as their primary goal (Huckin & Coady,

1999). In other words, when learners encounter new words in the context of reading, listening, or even through social interactions, they may incidentally learn their meaning without consciously intending to do so. Incidental vocabulary learning can occur in various contexts, such as through exposure to authentic materials such as books, articles, and videos (Ahmed, 2017). This type of vocabulary learning can be an effective way for learners to expand their vocabulary, especially when combined with deliberate vocabulary instruction and practice. Additionally, online incidental vocabulary learning refers to the process of acquiring new vocabulary incidentally while engaging in online activities such as reading, watching videos, or interacting with others on the internet (Sockett & Toffoli, 2012). One such strategy is to engage in extensive reading of online texts that are of interest to the learner. This may help to build familiarity with new words and reinforce their meaning in context. Indirectly, engaging in online discussions with others can also be a useful way to learn new vocabulary incidentally. By using a combination of reading, online tools, and social interaction, learners can gradually build up their vocabulary and become more confident in their ability to use new words in context.

However, incidental vocabulary learning has limitations and challenges that need to be taken into account when designing language instruction. Firstly, incidental vocabulary learning relies on exposure to authentic materials such as books, articles, and videos (Ahmed, 2017), but the coverage of vocabulary in these materials may not be comprehensive or tailored to the learners' needs. Learners may miss important words that are not frequently used in the materials they encounter. Secondly, incidental vocabulary learning requires learners to infer the meaning of new words from the context in which they are encountered. This can be challenging if the context is unclear or ambiguous, or if the learners' prior knowledge of the topic is limited. Thirdly, learners differ in their ability to acquire vocabulary incidentally, depending on their proficiency level, cognitive abilities, and motivation (Zafar & Meenakshi, 2012). Some learners may be able to infer the meaning of new words more easily than others, while some may need more explicit instruction and practice.

Vocabulary Size and Language Fluency

Since vocabulary and fluency are closely related, teachers and language learners should put equal emphasis on both areas (Laufer & Nation, 1995). This can be done through activities such as reading and listening to authentic materials in the language and using spaced repetition software to learn and review new vocabulary (Munday, 2015). Fluency is an essential component of language learning that refers to the ability to use language accurately, appropriately, and efficiently. It is often considered a prerequisite for social and professional success, as it allows individuals to communicate effectively with others in various settings. Several factors contribute to fluency in language learning, and one of the primary factors is vocabulary knowledge (Koizumi & In'nami, 2013). A high positive association between vocabulary size and language fluency has shown that individuals with a larger vocabulary are more fluent in their language use than those with a smaller vocabulary (Rahman, Yap, & Darmi, 2018). According to Vermeer (2001), the amount of a person's vocabulary directly correlates with their proficiency in the language. It was discovered that this association held across a variety of languages and language uses settings, including speaking and writing. Another factor of the most important is practice. Regular exposure to the language, whether through reading, listening, speaking, or writing, is essential for developing fluency (Zhang, 2009). Feedback is another element that influences fluency. Learners who receive feedback on their language use, either from teachers or peers, are more likely to develop their fluency than those who do not. This feedback can help learners identify areas where they need improvement and to develop strategies for improving their language use. Furthermore, there is a need for research on the role of technology in promoting language

fluency, such as the ways in which technology can be used to provide feedback, facilitate practice, and promote interactions and communications, all of which can contribute to the development of fluency in language learners (Shih, 2011).

Methodology

Platform

Ding Talk, an intelligent mobile office platform, was used as the main platform for education in Chinese primary schools during the COVID-19 lockdown period. Owning the characteristics of recording, sharing the screen, and communication, this app provides a convenient platform for online learning. Furthermore, through this app social interactions and proper feedback can also be achieved in the forums.

Participants

This study focuses on first-year students in a Chinese public elementary school. In one class, 24 students were chosen at random and further averagely divided into three small experimental groups. For the background of the participants' learning experiences, the instructor orally questioned them and got to know that none of them has participated in MALL forums before or been exposed to other Mandarin learning contexts except for school courses. Once, a week, the 24 participants were required to share with their peers their extracurricular reading contexts, including small stories, fables, poems, etc. In addition, one instructor took part in the forums to provide feedback after the students finished their presentations every time. The participants were also encouraged to question each other about their sharing contexts. One month after the four sharing forums ended, the researcher asked the three experimental groups to share the reading once more. In the meantime, the researcher randomly selected eight other pupils in the same class as the control group who were not asked to take part in the extracurricular sharing forum before and held a reading forum in the same manner as the experimental groups.

Procedures

First, the researcher recorded the videos of each online sharing of the experimental and comparison groups, and then converted the participants' sharing contents into the text in order to obtain the corpus of 24 texts for each of the five times of the experimental group and 20 texts for the comparison group once. In order to study the changes in participants' lexical richness, the collected and transcoded corpus needed to be subjected to a word separation process. In this experiment, the corpus was manually word-separated and saved in plain text format. Although Chinese is a language with monosyllabic words as the basic unit, as the Chinese vocabulary continued to develop, bisyllabic words gradually became dominant. And later, trisyllabic words, four-character idioms, hiatus words, and some specific phrases gradually appeared, which led to words being difficult to define in Chinese. Therefore, before analyzing the richness of Chinese vocabulary, the collected and transcoded corpus should be divided into words. As the language used by the participants in sharing was Chinese, the word-separation test was conducted using the criteria defined by Zhang Xianda for Chinese words (the defining criteria are shown in Table 1). Afterwards, the types and tokens of each context are counted for the following analysis.

Second, spoken fluency can be considered an important indicator for assessing language fluency. Fluent spoken expression is usually expressed as coherent, smooth, and untroubled speech output. In this research, the number of verbal pauses, repetitions, and corrections during each time among participants in both the experimental and comparison groups was documented manually. The researcher accomplished this by carefully observing video recordings. Verbal pauses were identified when participants appeared stuck for two seconds or

longer, repetitions were noted when participants repeated the last word or phrase spoken, and corrections were recorded when participants made changes to their previous words or phrases. These indicators were used to analyze the spoken fluency of the learners.

Third, the 24 students in the experimental group were invited to complete a post-study questionnaire about their learning experiences after the study. This questionnaire was administered online via Wenjuanxing, and it consisted of 15 Likert-scale items and one open-ended item. For the Likert-scale items, participants rated 15 statements using a five-point scale (5 = "Strongly agree", 4 = "Somewhat agree", 3 = "Neutral", 2 = "Somewhat disagree", and 1 = "Strongly disagree"). Since this study is designed to examine the effects of MALL, which is a brand new method for the participants, the researcher formulated this questionnaire to address aspects of the learning experience, such as participants' opinions about the online forums, whether they enjoyed joining the collaborative context, whether they felt it was effective compared to the traditional classroom learning, and more. After the Likert-scale items, participants were encouraged to answer an open-ended question which allowed them to write about other factors that may have an influence on their online learning process and to discuss anything that came to mind.

Table 1

Definition Standards and Examples of Chinese Words (Zhang, 1998)

Categories	Examples	Word count	Category	Examples	Word count
Verb + verb (Intransitive verbs)	Come in Get out	1	Determiners	This That One	1
Verb + verb (Transitive verbs)	Forget Know	1	Pronouns	Myself Them	1
Verb + noun (Free)	Read books Buy apples	2	Adjectives	Pretty Black	1
Verb + noun (Finite)	Dance Walk	1	Negative adverbs	Not neither	1
Noun (Name)	Trousers Cups	1	Adverbs	Very Already	1
Noun (Position A)	On the table In the room	1	Temporal adverbs	Today Everyday	1
Noun (Position B)	Here Above	1	Conjunctive adverbs	But Because	1
Measure words	One piece Two pieces	2	Function words	Of, be, on	1

Note. Some of the word counts above their categories may seem vague, but they are accurate when translated into the Chinese language.

Results and Analysis

Vocabulary diversity, which refers to the quantity and variety of words a person uses in language output, can be utilized to evaluate a learner's level of vocabulary knowledge and the variety in their use of vocabulary as demonstrated by language output. A person is typically seen as having a high level of lexical diversity if they have a vast vocabulary and can express themselves using a variety of terms. Vocabulary diversity can be calculated through various indicators, which are derived from analyzing learners' written and spoken texts. These indicators offer a quantitative evaluation of lexical diversity. While the Type-Token Ratio (TTR) is commonly used, it has limitations related to text length and the potential for lexical repetition. As texts grow longer, TTR tends to decrease. To address this, the Uber index formula is proposed in this paper as a measure of lexical

diversity. Dewaele and Pavlenko pointed out Uber index is adequate for measuring the lexical diversity for early stages of vocabulary acquisition. The formula, U = (log(tokens) ^{2}/ (log(tokens) - log(types)), takes into account the total number of tokens and the number of unique types in the text, providing a more accurate assessment of vocabulary richness.

Table 2

Descriptive Statistics for U of the Experimental Group of the First Four Times

	N	Min.	Max.	*M*	*SD*
First	24	17.77735	30.12479	23.22631	0.95501
Second	24	13.60353	57.16690	24.80188	1.99895
Third	24	18.04270	43.48548	27.83521	3.66456
Fourth	24	18.56574	71.88844	38.00498	4.34774

Table 2 reveals that, despite a slight rise in the second-time mean (M = 24.80188) compared to the first-time mean (M = 23.22631), the mean of the experimental group's U-values overall tended to rise. The *SD* values are gradually increasing, which suggests that vocabulary diversity is expanding. Following a month of involvement in the Chinese language learning forum, the vocabulary size in the experimental group was growing. The text corpus additionally demonstrated that the students' vocabulary knowledge was developing and that they could use new or more advanced terms to describe similar concepts, i.e., the variety of words used was expanding.

Table 3

Descriptive Statistics for U of the Experimental Group Post-Test (Fifth) and the Comparison Group

	N	Min.	Max.	*M*	*SD*
Fifth	24	13.90680	56.90042	37.80524	12.79698
Comparison group	20	18.56574	28.85403	21.00749	3.62270

In Table 3, the mean value of U in the fifth post-test (M = 37.80524) for the experimental group was slightly lower than that of the fourth (M = 38.00498). The large increase in the standard deviation (SD = 12.79698), on the other hand, is due to the occurrence of some extreme values. In this forum, two students shared poems and one student shared a literary text. Due to the specificity of these two genres, the U-values of the texts were much larger than that of the mean. On the other hand, in the video recording observations, the researcher noted that some students failed to get into the mood in time after a period of rest, resulting in the U-values of the texts they shared being much smaller than the average. As can be seen in the descriptive statistics for the comparison group, the minimum (U = 18.56574), maximum (U = 28.85403), and mean (U = 21.00749) values of U are close to the first-time data for the experimental group. And the increase in data for participants in the experimental group is visible after four sessions of forum participation. Even with a slight drop in data compared to the fourth forum, the experimental group's post-test data were far greater than that of the comparison group.

Pauses can consist of periods of suspension or interruption in the middle of a speech. Fewer pauses are usually associated with higher speech fluency. Speech fluency tends to be higher when a person can express themselves fluently without frequent pauses to think or search for words. Repetitions occur when a speaker repeats words or phrases either intentionally or unintentionally. In terms of fluency, frequent unintentional repetitions may suggest difficulties in organizing thoughts or finding the right words. Corrections refer to the amendment or modification of previous expressions during a speech. Fewer revisions may be associated with

higher verbal fluency. Fluent oral expressions usually reduce the need for revision because of the ability to select and use vocabulary and grammatical structures more accurately while speaking.

Table 4

Comparison of the Mean (M) and Standard Deviation (SD) of the Number of Pauses, Repetitions, and Corrections in the First Four Times of the Experimental Group (N = 24)

	First		Second		Third		Fourth	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Pauses	4.375	4.661	2.667	2.828	1.75	1.359	1.917	1.414
Repetition	3.167	3.002	2.667	1.414	1.754	1.318	1.667	0.707
Correction	1.542	1.663	2.042	0.707	1.533	1.649	1.417	1.640

Based on the data presented in Table 4, the average number of pauses, repetitions, and revisions during oral sharing among students in the experimental group showed a decreasing trend in the first four forums. The mean number of pauses in the fourth forum (M = 1.917) was slightly higher than the third forum (M = 1.75), but still considerably lower than the mean of the first forum (M = 4.375). However, the fluctuations in the standard deviation of these data sets can be attributed to various factors, such as the students' varying abilities to adapt to MALL as a new learning mode.

During the first oral sharing, three students paused and repeated their words more than 10 times, while one student paused 21 times. In contrast, in the second oral sharing, only one student paused more than 20 times, while the rest of the students had fewer than 10 pauses and repetitions in all measures. This difference may explain why the standard deviation of the number of corrections was larger for the third time (SD = 1.649) compared to the second (SD = 0.707).

Additionally, when comparing video recordings, it was observed that the number of corrections and repetitions during reading aloud was significantly lower than when students expressed their own thoughts. In the third forum, two students recited a poem and a piece of prose in their own voices, which received acknowledgment and encouragement from the instructor. Consequently, in the fourth sharing, eight students intimated their peers by reciting poems or prose in the same way, while others continued to summarize and express their thoughts in their own words. This shift resulted in a lower standard deviation of repetitions and corrections in the fourth forum (SD = 0.707, 1.640) compared to the third forum (SD = 1.318, 1.649), indicating a further decrease in variability.

Table 5

Comparison of the Mean (M) and Standard Deviation (SD) of the Number of Pauses, Repetitions, and Corrections on the Experimental Group's Post-Test (Fifth) and the Comparison Group

	Fifth (N = 24)		Comparison group (N = 20)	
	M	*SD*	*M*	*SD*
Pauses	1.75	1.359	4.85	3.453
Repetition	1.754	1.318	4.55	2.999
Correction	1.533	1.640	3.65	2.621

According to the information in Table 5, the experimental group's post-test results for the three sets of data (M = 1.75, 1.754, 1.533; SD = 1.359, 1.318, 1.640) were comparable to those from the fourth forum (M = 1.917, 1.667, 1.417; SD = 1.414, 0.707, 1.640). This shows consistency in the number of repetitions and pauses. The comparison group, nevertheless, displayed mean values for the number of pauses and repetitions (M = 4.85, 4.55)

that were comparable to those observed for the experimental group during the first forum (M = 4.375, 3.167). The experimental group, however, showed considerably lower levels for all markers than the comparison group after taking part in four online sharing forums.

Table 6

Descriptive Statistics of the Data Collected From the Questionnaire (N = 24)

	Questions	*M*	*SD*
1	I prefer to participate in online learning activities rather than traditional classroom learning and to complete my learning tasks on time.	3.29	1.16
2	Online learning allows me to develop my ability to communicate and collaborate with my peers and demonstrate my personal value.	3	1.44
3	I can't see the teacher's care and attention in the online forums.	2.58	1.47
4	Online learning helps me better set my learning goals.	3.13	1.08
5	I can grasp the content better in online classes than in traditional classrooms.	2.54	1.06
6	Online learning makes learning more interesting and attracts my attention.	2.79	0.93
7	Online forums do not give us more attractive and appropriate active learning opportunities.	3.25	1.07
8	The online learning method does not allow me to manage my time and complete my learning tasks effectively.	2.79	1.32
9	I prefer to demonstrate my learning achievements or express my opinion in online learning process.	2.88	1.23
10	The online learning approach allows me to explore in depth the issues that interest me.	2.79	1.02
11	Teachers are able to give us timely comments on the online learning tasks we have completed or the questions we have answered.	4.04	1.04
12	Online learning makes it easier for me to organise my learning schedule and pace myself.	2.96	0.95
13	I think online learning will better improve my learning efficiency compared to traditional classroom learning.	2.58	1.14
14	Online learning does not help me understand the key points better.	3.54	1.25
15	I often tend to get distracted during online learning.	3.79	1.10

Note. All questions were rated on a seven-point Likert scale, where 5 = "Strongly agree", 4 = "Somewhat agree", 3 = "Neutral", 2 = "Somewhat disagree", and 1 = "Strongly disagree".

The descriptive statistics of the questionnaire data show that the students' evaluation of the learning outcomes in the forum was neutral towards positive, including the improvement of the ability to finish tasks, communicate and collaborate with peers, set goals, etc. However, students rated their motivation and self-control for learning as neutral towards negative, such as the tendency for online learning to lead to distraction and low motivation. In addition, the data from the third and eleventh questions show that the teacher's, or in other words, the instructor's role in guiding and assisting students in the learning process is significant.

Discussion

The study was designed to seek the effect of MALL on students' vocabulary diversity and oral language fluency. The results indicated that online learning did make a difference. Students in the experimental group showed an overall upward trend in *U*-values for text sharing over the four weeks of the online forum, and the experimental group also showed higher metrics than the control group in the post-test data. This corresponds with the previous literature review on the effectiveness of incidental vocabulary learning in expanding students' vocabulary. Mobile devices and applications offer a platform for language acquisition that is not available in traditional classroom learning because of their convenience and flexibility. Online learning forums expose students to a rich language environment in which they can learn new words from the context or speculate on the meaning of unfamiliar words, thus enabling them to acquire and use old and new vocabulary. However, it is also important to point out that the experimental group exhibited a slight decrease in the mean *U*-value during the

post-test (fifth) compared to the fourth, which is not dramatic. Since the post-test was conducted one month after the fourth forum, some students may get unfamiliar with the method. When acquiring knowledge or skills in a specific domain, the Ebbinghaus Forgetting Curve elucidates the natural tendency for memory to diminish over time. Consequently, when learning is interrupted for a period, the previously acquired knowledge gradually fades away, resulting in challenges with recall and application. Consolidation and review are imperative for effective learning and memory retention. Through regular review and application of knowledge, one can reinforce comprehension and facilitate the transformation of information into long-term memory. However, if learning is halted for a duration, the opportunity for proper consolidation and review is lost, leading to a regression in knowledge. Learning new information and skills demands a certain cognitive load encompassing attention, memory, and cognitive processes. Interruptions in learning can impede these cognitive processes, necessitating additional effort and time to reacquire the previous level of proficiency.

Another factor that should be taken into account in language learning is peer feedback and adult scaffolding. As mentioned previously, during the third forum, a notable addition was the inclusion of poetry readings by two students, which was absent in the previous forums. The teacher responded positively to this addition, acknowledging the emotionally rich and fluent language used by the students. The teacher also provided additional suggestions, including that following the recitation, the students may engage in open discussions about their thoughts and feelings in relation to the text or test fellow pupils on their comprehension of this topic material, etc. And thus, in the fourth forum, eight students followed the example of their peers and took the advice of their teachers to present themselves in the same way. When students engage in peer feedback, they receive immediate and relevant input from their peers, which can enhance their linguistic skills. Through peer interactions, learners have the opportunity to practice using the target language in a social context, facilitating the development of fluency. Moreover, receiving feedback from peers can foster a supportive and collaborative learning environment, leading to increased motivation and engagement. Examining Table 4, it is evident that the test group experienced a decrease in the average values of repetition and correction during the fourth assessment compared to the third assessment. In conjunction with the results of the questionnaire (see Table 6), students showed positive comments about the instructor's role in guiding them in the online forum, including the fact that the instructor was able to give more timely and targeted feedback and assistance to students in online learning than in the traditional classroom. Therefore, it is reasonable to believe that the impact of peer feedback and adult scaffolding on language learning, particularly language fluency, is noteworthy.

However, there was a slight increase in the mean value of pauses. This increase can be attributed primarily to the essential role of pauses in expressing the emotions of the reciter during poetry recitation. It should be noted that some individuals naturally incorporate deliberate pauses in their speech or strategically employ pauses for emphasis. Consequently, it's necessary to be aware that linguistic fluency is a complex concept, and it might be oversimplified to judge it just by the number of pauses, repetitions, or corrections. Fluency is also significantly influenced by other elements like vocabulary, grammar, pronunciation, and overall communicative efficiency. Furthermore, cultural and environmental elements, even the level of cognitive ability, may have an impact on how fluency is perceived.

Additionally, it is worth noting that the open-ended question of the questionnaire revealed some potential issues. Among the answers, seven responses pointed out the poor self-control and concentration problems among students in the online learning forum. And five responses demonstrated negative effects of the objective

environment, such as lack of proficiency in the use of electronic devices and unstable network reception. These issues suggest improvements for future research in this area as well as for the specific practice of online teaching.

On one hand, to improve the online learning experience, it is important to provide engaging and interactive resources that captivate students' attention. This can be achieved by incorporating diverse teaching methods like multimedia presentations, group discussions, and gamification, making the learning process more stimulating and interesting. Additionally, students should be encouraged to create a designated study area at home, allowing them to minimize distractions and concentrate on their coursework. Offering guidance and support in time management and study skills can also help students enhance their self-control and concentration abilities. Furthermore, regular breaks during online learning should be implemented to prevent mental fatigue and improve students' ability to remain focused. On the other hand, it is essential to provide students with technical support and training sessions in order to encourage their technological proficiency in online learning. Their ability to use software programs and electronic equipment will improve as a result. Students who are taking online classes should be given clear and comprehensive guidance on how to troubleshoot typical technical issues. And backup strategies should be developed, such as offering offline materials or recorded lectures, to combat chronic network connectivity concerns. In terms of future research directions, it would be helpful for researchers to address some of the drawbacks of this study (such as expanding the participant pool, stretching the study's duration beyond eight weeks, and taking the parents' scaffolding role into account).

Conclusion

This study provided insight into the advantages of MALL for language learners through comprehensive analysis and investigation. The results imply that MALL can help students have a more diverse vocabulary by providing an interactive and engaging learning environment that improves their lexical knowledge. With the use of mobile devices, students may participate in a variety of vocabulary-building activities that encourage active engagement and retention. Additionally, the research has shown that MALL has a beneficial impact on students' spoken language fluency. Learners can practice speaking in authentic contexts, participate in the rich language environment, and more by using mobile applications and online resources. These characteristics enable learners to acquire fluency, oral communication skills, and confidence in their ability to effectively express themselves. MALL integration in language education holds considerable promise for fostering language acquisition outside of the traditional classroom as technology develops and mobile devices become more widely available. However, MALL should be utilized as a supplementary resource to classroom learning, which is important to recognize, since face-to-face interaction with guidance from qualified teachers is still crucial for complete language development. Teachers and students can both open up new doors for language learning by embracing the power of modern technology and adopting innovative approaches. This will promote higher linguistic competency and cross-cultural communication abilities in the digital age.

References

Adair-Hauck, B., & Donato, R. (2002). The PACE model: A story-based approach to meaning and form for standards-based language learning. *The French Review, 76*(2), 265-276. Retrieved from https://www.jstor.org/stable/3132708

Ahmed, S. (2017). Authentic ELT materials in the language classroom: An overview. *Journal of Applied Linguistics and Language Research, 4*(2), 181-202.

Al-Shamsi, A., Al-Mekhlafi, A. M., Busaidi, S. A., & Hilal, M. M. (2020). The effects of mobile learning on listening comprehension skills and attitudes of Omani EFL adult learners. *International Journal of Learning, Teaching and Educational Research, 19*(8), 16-39. Retrieved from https://doi.org/10.26803/ijlter.19.8.2

Arbaugh, J. B., & Benbunan-Fich, R. (2007). The importance of participant interaction in online environments. *Decision Support Systems, 43*(3), 853-865. Retrieved from https://doi.org/10.1016/j.dss.2006.12.013

Brush, T., & Saye, J. W. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment. *The Journal of Interactive Online Learning, 1*(2), 1-12.

Bunch, G. C. (2013). Pedagogical language knowledge. *Review of Research in Education, 37*(1), 298-341. Retrieved from https://doi.org/10.3102/0091732x12461772

Burston, J. (2014). MALL: The pedagogical challenges. *Computer Assisted Language Learning, 27*(4), 344-357. Retrieved from https://doi.org/10.1080/09588221.2014.914539

Chan, S. (1999). The Chinese learner—A question of style. *Education + Training, 41*(6/7), 294-305. Retrieved from https://doi.org/10.1108/00400919910285345

Chinnery, G. M. (2006). Going to the MALL: Mobile assisted language learning. *Language Learning & Technology, 10*(1), 9-16.

Choi, I., Land, S. M., & Turgeon, A. J. (2005). Scaffolding peer-questioning strategies to facilitate metacognition during online small group discussion. *Instructional Science, 33*(5-6), 483-511. Retrieved from https://doi.org/10.1007/s11251-005-1277-4

Curdt-Christiansen, X. L. (2020). Environmental literacy: Raising awareness through Chinese primary education textbooks. *Language, Culture and Curriculum, 34*(2), 1-16. Retrieved from https://doi.org/10.1080/07908318.2020.1797078

Davis, B., & Summers, M. (2015). Applying Dale's cone of experience to increase learning and retention: A study of student learning in a foundational leadership course. In *Q Science Proceedings* (Vol.4, p. 6). Retrieved from https://doi.org/10.5339/qproc.2015.wcee2014.6

Duman, G., Orhon, G., & Gedik, N. (2014). Research trends in mobile assisted language learning from 2000 to 2012. *ReCALL, 27*(2), 197-216. Retrieved from https://doi.org/10.1017/s0958344014000287

Ellis, R. (2001). Introduction: Investigating form-focused instruction. *Language Learning, 51*(s1), 1-46. Retrieved from https://doi.org/10.1111/j.1467-1770.2001.tb00013.x

Gacs, A., Goertler, S., & Spasova, S. (2020). Planned online language education versus crisis-prompted online language teaching: Lessons for the future. *Foreign Language Annals, 53*(2), 380-392. Retrieved from https://doi.org/10.1111/flan.12460

Godwin-Jones, R. (2019). Riding the digital wilds: Learner autonomy and informal language learning. *Scholarspace.manoa.hawaii.edu, 23*(1), 8-25. Retrieved from https://doi.org/10125/44667

Goundar, S. (2011). What is the potential impact of using mobile devices in education? *GlobDev 2011, 12*(3). Retrieved from https://aisel.aisnet.org/globdev2011/16

Govindasamy, P., Yunus, M. M., & Hashim, H. (2019). Mobile assisted vocabulary learning: Examining the effects on students' vocabulary enhancement. *Universal Journal of Educational Research, 7*(12A), 85-92. Retrieved from https://doi.org/10.13189/ujer.2019.071911

Guo, F., Zhang, Y., & Wu, Z. (2022). Mobile-assisted vocabulary learning through the Shanbay App outside the classroom: Effects of self-regulation and peer scaffolding. *Frontiers in Psychology, 13*, 993224. Retrieved from https://doi.org/10.3389/fpsyg.2022.993224

Hannafin, M. J., & Land, S. M. (2000). Technology and student-centered learning in higher education: Issues and practices. *Journal of Computing in Higher Education, 12*(1), 3-30. Retrieved from https://doi.org/10.1007/bf03032712

Huckin, T., & Coady, J. (1999). Incidental vocabulary acquisition in a second language. *Studies in Second Language Acquisition, 21*(2), 181-193. Retrieved from https://doi.org/10.1017/s0272263199002028

Jandee, K., Lawpoolsri, S., Taechaboonsermsak, P., Khamsiriwatchara, A., Wansatid, P., & Kaewkungwal, J. (2014). Customized-language voice survey on mobile devices for text and image data collection among ethnic groups in Thailand: A proof-of-concept study. *JMIR Mhealth and Uhealth, 2*(1), e7. Retrieved from https://doi.org/10.2196/mhealth.3058

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher, 38*(5), 365-379. Retrieved from https://doi.org/10.3102/0013189x09339057

Katemba, C. (2021). Enhancing vocabulary performance through mobile assisted language learning at a rural school in Indonesia. *Acuity: English Language Pedagogy, Literature, and Culture, 6*(1), 1-11. Retrieved from https://doi.org/10.35974/acuity.v6i1.2457

Kerawalla, L., Luckin, R., Seljeflot, S., & Woolard, A. (2006). "Making it real": Exploring the potential of augmented reality for teaching primary school science. *Virtual Reality, 10*(3-4), 163-174. Retrieved from https://doi.org/10.1007/s10055-006-0036-4

Koizumi, R., & In'nami, Y. (2013). Vocabulary knowledge and speaking proficiency among second language learners from novice to intermediate levels. *Journal of Language Teaching and Research, 4*(5), 900-913. Retrieved from https://doi.org/10.4304/jltr.4.5.900-913

Laufer, B., & Nation, P. (1995). Vocabulary size and use: Lexical richness in L2 written production. *Applied Linguistics, 16*(3), 307-322. Retrieved from https://doi.org/10.1093/applin/16.3.307

Lee, E., & Hannafin, M. J. (2016). A design framework for enhancing engagement in student-centered learning: Own it, learn it, and share it. *Educational Technology Research and Development, 64*(4), 707-734. Retrieved from https://doi.org/10.1007/s11423-015-9422-5

Li, F., Fan, S., & Wang, Y. (2022). Mobile-assisted language learning in Chinese higher education context: A systematic review from the perspective of the situated learning theory. *Education and Information Technologies, 27*(7), 9665-9688. Retrieved from https://doi.org/10.1007/s10639-022-11025-4

Lin, C. C., Lin, V., Liu, G. Z., Kou, X., Kulikova, A., & Lin, W. (2019). Mobile-assisted reading development: A review from the activity theory perspective. *Computer Assisted Language Learning, 33*(8), 1-32. Retrieved from https://doi.org/10.1080/09588221.2019.1594919

Marra, R. M., Moore, J. L., & Klimczak, A. K. (2004). Content analysis of online discussion forums: A comparative analysis of protocols. *Educational Technology Research and Development, 52*(2), 23-40. Retrieved from https://doi.org/10.1007/bf02504837

Miangah, T. M., & Nezarat, A. (2012). Mobile-assisted language learning. *International Journal of Distributed and Parallel Systems, 3*(1), 309-319. Retrieved from https://doi.org/10.5121/ijdps.2012.3126

Molderez, I., & Fonseca, E. (2018). The efficacy of real-world experiences and service learning for fostering competences for sustainable development in higher education. *Journal of Cleaner Production, 172*, 4397-4410. Retrieved from https://doi.org/10.1016/j.jclepro.2017.04.062

Munday, P. (2015). The case for using Duolingo as part of the language classroom experience. *RIED. Revista Iberoamericana de Educación a Distancia, 19*(1), 83-101. Retrieved from https://doi.org/10.5944/ried.19.1.14581

Mystakidis, S., Berki, E., & Valtanen, J.-P. (2021). Deep and meaningful e-learning with social virtual reality environments in higher education: A systematic literature review. *Applied Sciences, 11*(5), 2412. Retrieved from https://doi.org/10.3390/app11052412

Octaberlina, L. R., & Muslimin, A. I. (2020). EFL students' perspective towards online learning barriers and alternatives using Moodle/Google classroom during COVID-19 pandemic. *International Journal of Higher Education, 9*(6), 1-9. Retrieved from https://doi.org/10.5430/ijhe.v9n6p1

Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Fretz, E., Duncan, R. G., … Soloway, E. (2004). A scaffolding design framework for software to support science inquiry. *Journal of the Learning Sciences, 13*(3), 337-386. Retrieved from https://doi.org/10.1207/s15327809jls1303_4

Rahman, A., Yap, N. T., & Darmi, R. (2018). The association between vocabulary size and language dominance of bilingual Malay-English undergraduates. *3L the Southeast Asian Journal of English Language Studies, 24*(4), 85-101. Retrieved from https://doi.org/10.17576/3l-2018-2404-07

Shabani, K., Khatib, M., & Ebadi, S. (2010). Vygotsky's zone of proximal development: Instructional implications and teachers' professional development. *English Language Teaching, 3*(4), 237-248. Retrieved from https://files.eric.ed.gov/fulltext/EJ1081990.pdf

Shih, R. C. (2011). Can Web 2.0 technology assist college students in learning English writing? Integrating Facebook and peer assessment with blended learning. *Australasian Journal of Educational Technology, 27*(5). Retrieved from https://doi.org/10.14742/ajet.934

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., & Akinkuolie, B. (2021). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from public release of 2012 to early 2020. *Computer Assisted Language Learning, 36*(3), 1-38. Retrieved from https://doi.org/10.1080/09588221.2021.1933540

Singh, G., O'Donoghue, J., & Worton, H. (2005). A study into the effects of elearning on higher education. *Journal of University Teaching and Learning Practice, 2*(1), 16-27. Retrieved from https://doi.org/10.14453/jutlp.v2i1.3

Sockett, G., & Toffoli, D. (2012). Beyond learner autonomy: A dynamic systems view of the informal learning of English in virtual online communities. *ReCALL, 24*(2), 138-151. Retrieved from https://doi.org/10.1017/s0958344012000031

Sung, Y. T., Chang, K. E., & Yang, J. M. (2015). How effective are mobile devices for language learning? A meta-analysis. *Educational Research Review, 16*, 68-84. Retrieved from https://doi.org/10.1016/j.edurev.2015.09.001

Vermeer, A. (2001). Breadth and depth of vocabulary in relation to L1/L2 acquisition and frequency of input. *Applied Psycholinguistics, 22*(2), 217-234. Retrieved from https://doi.org/10.1017/s0142716401002041

Wei, X. (2008). Implication of IL fossilization in second language acquisition. *English Language Teaching, 1*(1), 127-131. Retrieved from https://doi.org/10.5539/elt.v1n1p127

Yu, L., Sung, Y., & Chang, K. E. (2007). A mobile-device-supported peer-assisted learning system for collaborative early EFL reading. *DOAJ (DOAJ: Directory of Open Access Journals), 11*(3), 130-151.

Zafar, S., & Meenakshi, K. (2012). Individual learner differences and second language acquisition: A review. *Journal of Language Teaching and Research, 3*(4), 639-646. Retrieved from https://doi.org/10.4304/jltr.3.4.639-646

Zhang, S. (2009). The role of input, interaction and output in the development of oral fluency. *English Language Teaching, 2*(4), 91-100. Retrieved from https://doi.org/10.5539/elt.v2n4p91

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41*(2), 64-70. Retrieved from https://doi.org/10.1207/s15430421tip4102_2