



Mobile-assisted language learning in Chinese higher education context: a systematic review from the perspective of the situated learning theory

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Abstract

Recent years have witnessed numerous systematic investigations on mobile-assisted language learning (MALL). However, very few research synthesis studies focused on the higher education context in mainland China. This paper provides a systematic review of the findings of 23 studies published between 2015 and 2020 in mainland China. The aim of this review is twofold: 1) to examine prevalent researched elements in extant MALL studies; and 2) to investigate ways in which the two original components of the Situated Learning Theory (SLT), including Legitimate Peripheral Participation and Communities of Practice (Lave & Wenger, 1991), have a bearing on MALL. This systematic review resulted in two major findings. First, five key researched elements were revealed, e.g., target language teaching areas, and adopted applications/software. Second, guided by the two original elements of SLT, four derived elements were identified, namely authenticity, social interactions and collaborations, apprenticeship learning, and beliefs and behaviours. The findings suggest the need to develop sound MALL pedagogies associated with sociocultural aspects of language learning in relevant contexts. This review study also provides insights into how Chinese language professionals and practitioners can improve curriculum design and resource development to adapt to future trends in MALL.

Keywords Mobile-assisted language learning (MALL) · Situated learning theory (SLT) · Higher education (HE) · Mainland China

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1 Introduction

Regardless of recent advancements in English language education in China, English learning and teaching in Chinese Higher Education (HE) remains problematic (C. Li, 2014). Enlightened by the “Internet+” policy (China’s State Council, 2010), modern information and communication technologies have been widely adopted in English language education in Chinese universities (Ma et al., 2014). Using these technologies could make language learning and teaching more economical and effective (Hu & McGrath, 2011). Mobile technologies, which are widely and easily accessible on university campuses, have been regarded as a potentially viable way to alleviate issues in English language education in Chinese HE (Wang & Cui, 2016). Mobile learning (m-learning) refers to the use of mobile technologies for learning purposes (Kukulska-Hulme & Shield, 2007).

As the integration of m-learning and language learning, mobile-assisted language learning (MALL) can enhance language learning in formal and/or informal environments (Kukulska-Hulme & Shield, 2008). MALL has been increasingly incorporated into the second language (L2) education in worldwide HE settings (Adams Becker et al., 2017). It is considered conducive to language learning because of the following four features. First, MALL eliminates the time and space limitations of language learning, so that language learners can access learning resources from anywhere at any time (Hoven & Palalas, 2011). Second, MALL extends interactivity, collaboration, and real-context contact for language learning across educational settings (Jing, 2018). Third, it allows language learning to occur in various ways and provides a platform for interpersonal learning practice, thanks to the strengths of mobile devices equipped with multimedia (Kukulska-Hulme & Shield, 2008). Fourth, it empowers language learners to learn individually or together (Sharples, 2013), and enables them to manage learning following personal preferences and authentic needs. In general, mobile technologies have made access to education more straightforward and provided bountiful learning opportunities (Sharples, 2007), through portability, affordances, accessibility, connection, and personalised experiences (Laurillard, 2007).

These mentioned advantages have made MALL broadly welcomed for educational practices (Gorjian, 2012). However, issues, including socioeconomic conditions, learner experience, institutional supports, and technical affordances, have left the adoption of MALL-based pedagogies in HE systems questionable (Li et al., 2021). This is true, especially in developing countries, such as China (Khan et al., 2015). Hence, the growing prevalence of MALL in the Chinese HE context calls for a systematic review of relevant MALL studies in the chosen context to identify major researched elements and find gaps. Considering particular user groups, academic contexts, and adopted applications, delving into MALL practices could provide a deeper understanding of the explored topics and more valid research findings (Chen et al., 2020). Also, it is timely to further synthesise findings from the perspective of language learning theories to pinpoint directions for future MALL research and practice. Grounded in the Situated Language Theory

(SLT), this study examines a selection of empirical MALL studies in Chinese HE contexts, published between the years 2015 and 2020.

2 Background

In the past decade, the increasing synthesis and systematic analyses pertaining to MALL have indicated a growing interest in this research field (Zhou, 2020). A wealth of review studies has identified the status quo and development trends of MALL by synthesising and analysing MALL publications over different periods. This section will elicit a few extant MALL synthesis studies worldwide, including studies conducted in mainland China.

2.1 Previous worldwide synthesis studies of MALL

Previous MALL research syntheses have covered a wide range of topics. However, most of them reported overlapping researched elements or were limited to certain aspects. Some of these reviewed aspects include frequent research foci (Crompton & Burke, 2018), theoretical frameworks (Su & Zou, 2020), effect sizes (Chen et al., 2020), sample sizes (Kamasak et al., 2021), and research designs (Viberg & Grönlund, 2012). Additionally, other reviews examined learner levels (Sung et al., 2016), intervention durations (Taj et al., 2016), educational levels (J. J. Lin & Lin, 2019), types of mobile device-based tools/approaches (Burston, 2015), and target language skills (C. C. Lin et al., 2020).

The literature introduced above contributes to understanding MALL from various perspectives. For instance, MALL has been effective in HE practice (Crompton & Burke, 2018). Effectiveness issues have often been investigated using experimental/quasi-experimental research designs (Kamasak et al., 2021). MALL-based pedagogies have positively facilitated learning outcomes, particularly lexical and listening skills (Lin & Lin, 2019), due to situated activities (Chen et al., 2020), collaborative features (Zou et al., 2020), and social contacts (Kukulska-Hulme & Shield, 2008). Different learning theories and instructional approaches have been applied to analyse MALL, including constructivism (Martin et al., 2020), sociocultural theory (Su & Zou, 2020), and self-directed learning (Chen et al., 2020). Mobile phones/smartphones have been the dominant MALL tools (Kaliisa & Picard, 2017). However, despite the high volume of international MALL synthesis literature, systematic reviews on MALL in mainland China remain scanty.

2.2 Previous synthesis studies of MALL in mainland China

Previous MALL review studies were primarily narrative literature reviews or introductory analyses reiterating the status quo and research trends of MALL studies, such as the study by Zhao (2019a). Only a few reviewed MALL studies conducted in mainland China, and the majority of them synthesised similar researched topics, for instance, research trends, methods, and foci (Chen & Jia, 2020; He, 2019). In addition,

researched periods were largely overlapping, for example, 2004–2014 (Xu & Zhao, 2015). Although MALL studies in mainland China have been increasing (Lyu & Qi, 2020), systematic knowledge concerning MALL in this context has been overlooked (Zhou, 2020).

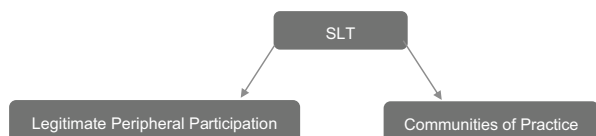
The present collection of MALL literature has made tremendous contributions to leading the trends and filling in gaps of MALL practice in mainland China. For instance, in alignment with the results regarding applied theoretical frameworks adopted in language education worldwide (Zain & Bowles, 2021), the sociocultural theory was frequently adopted to underpin MALL in mainland China (Xu & Zhao, 2015). Most Chinese MALL studies measured MALL effects on general language proficiency (Chen & Jia, 2020) rather than certain language skills (Hu & Shen, 2014). However, this was different from international findings that vocabulary was the most researched language skill (Persson & Nouri, 2018), followed by writing (Su & Zou, 2020). Similar to the findings concerning target educational levels from a wider angle of MALL literature (Taj et al., 2016), HE levels have received the most attention in Chinese MALL studies (He, 2019). Mobile phones/smartphones have outperformed other MALL tools both internationally (Crompton & Burke, 2018) and in China (Wang & Cui, 2016). However, most review studies in mainland China only used generic terms (e.g., mobile devices) rather than specified device types. This review will clarify the target language skills and identify device and application types in the selected MALL publications.

3 Theoretical framework

The theoretical framework underpinning this study is the Situated Learning Theory (SLT) (see Fig. 1). Lave and Wenger (1991) first proposed the SLT subsumed under the umbrella of sociocultural theory (Vygotsky, 1980). Lave and Wenger (1991) suggested that learning production and development are embedded and situated in authentic activities, contexts, and cultures through learners' changing participation as novices in a socially-constructed world of practice. The two most widely-recognised SLT components are Legitimate Peripheral Participation (LPP) and Communities of Practice (CoPs) (Lave & Wenger, 1991).

The SLT highlights that human activities are situated in contexts (Arnseth, 2008). It emphasises social and cultural interactions and collaborative learning activities (Su & Zou, 2020). The theory scaffolds language learning with social interactions and collaborations (Warschauer, 2005) and real-life situations (Kim & Kwon, 2012); it also holds that human activities are mediated by tools (Lantolf, 2000). The SLT is frequently and widely employed in MALL research (Hwang & Chen, 2011), because the mediation, assisted by tools used, is a common issue in MALL (Viberg & Grönlund, 2012).

Fig. 1 SLT as the theoretical framework of this review (Lave & Wenger, 1991)



MALL, echoing with the theory, situates learning in authentic practice and contextualises learning in social communities with the assistance of mobile-based mediation/tools (Binti Pengiran & Besar, 2018).

Different SLT constituents have been applied to the knowledge of MALL, especially in social interactions (Zhao, 2019b). For example, social activities have benefited the development of language knowledge (Ibáñez et al., 2011). Likewise, interactive and collaborative traits of the SLT have exerted positive impacts particularly on lexical proficiency (J. J. Lin & Lin, 2019) and reading abilities (Liu et al., 2018). Situated activities and authentic environments can facilitate the development of writing, listening, and speaking skills (Hwang et al., 2016). The SLT can also support learning by empowering learners to active participation (Palalas, 2011). Despite the above mentioned reasons, the SLT has been overlooked and received less attention than other widely-used sociocultural concepts in Chinese MALL publications, such as the zone of proximal development (Wang & Meng, 2014). Some Chinese MALL synthesis studies, such as Chen and Jia (2020), briefly mentioned the concept of the SLT as a whole instead of discussing its individual components. To fill in the gap, this study will specifically unveil the two original SLT components underlying MALL, namely LPP and CoPs.

4 Justification of this review study

This review will be the first MALL review study based on the SLT. This study synthesised MALL publications focusing on the HE context in mainland China by the different SLT components.

This study extends the reviewed time range to the most recent studies. Recent review studies have synthesised international MALL publications up to May 2020 (Kamasak et al., 2021) and updated knowledge of Chinese context-related MALL up to 2019 (Chen & Jia, 2020). Most syntheses in mainland China covered 2015 and earlier years, which reveals a big surge of MALL publications from 2015 (Chen et al., 2020). This is due to the worldwide popularisation of mobile phones/smartphones, particularly in China (Atwal, 2017). As such, incorporating the period from 2015 to the present time reflects the new trends in MALL studies in mainland China.

It is worth noting that this review study integrates MALL publications concerning Chinese HE contexts. HE is the most dominant educational level in Chinese MALL research (Gu, 2015), and there has been a dramatic increase and proliferation of MALL studies at this level (Zhao, 2019a). This review is timely as there has been little systematic knowledge exclusively regarding MALL in the Chinese HE system.

5 Research aim and questions

The main purpose of this review is to provide a systematic synthesis of MALL studies published between 2015 and 2020 through the lens of SLT in the HE context in mainland China. The study aims to address the following questions:

- (1) What are the research purposes, learning outcomes, target language teaching areas, educational contexts, and tools used in current MALL studies?
- (2) In what ways do the SLT components have a bearing on MALL in the Chinese HE context?

6 Methodology

A systematic review involves identifying, selecting, and synthesising primary research studies to provide a comprehensive and reliable picture of the topic being investigated (Oakley, 2012). This review study used the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) principle to report target researched items (Bowles & Brindle, 2017).

6.1 Search strategy

An extensive literature search was conducted in seven databases, including 1) Educational Resources Information Centre (ERIC); 2) Arts & Humanities Citation Index (A&HCI) through Web of Science; 3) Social Sciences Citation Index (SSCI) through Web of Science; 4) Social Sciences Citation Index Expanded (SCI-EXPANDED) through Web of Science; 5) SCOPUS; 6) EBSCO Host; and 7) Chinese Social Sciences Citation Index (CSSCI). A keyword search was performed in the mentioned databases to accurately and quickly locate relevant literature (Bramer et al., 2018).

Keeping the research aim and questions in mind, the researchers completed the literature search focusing on paper titles, abstracts, and keywords. Such a strategy empowered the researchers to access relevant studies with accurate detection and extensive coverage. As a result, the keyword search was initially done in line with the terms related to three key areas: m-learning, second language acquisition, and HE. Each of the terms above was then searched again combined with *higher education, university, college*. Quotation marks were used for phrase searches. In the CSSCI, the search terms were in English, and the Chinese equivalents were adopted for term search to ensure accurate results. Table 1 provides an overview of the search terms used. These terms were chosen due to their common use in MALL.

6.2 Selection criteria and process

The initial search resulted in a total of 2717 studies. Of these initially identified ones, 2569 studies were eliminated after removing duplicate and irrelevant studies by title search. As a result, 148 potentially relevant studies were kept after this selection process. During this process, the following inclusion and exclusion criteria were employed to guide the selection:

- (1) Relevance of the study: The publications addressed issues concerning m-learning in second language acquisition or L2 learning in HE settings.

Table 1 Overview of the search terms (in both English and Chinese)

M-learning	Language learning	Educational contexts
Mobile learning (移动学习)	Second language acquisition (二语习得)	Higher education (高等教育)
M-learning (移动学习)	Second language learning (二语学习)	University (大学)
Ubiquitous learning (泛在学习)	Second language (二语)	College (大专)
Context-aware (情景感知)	Foreign language learning (外语学习)	
Mobile devices (移动设备)	Foreign language (外语)	
Handheld devices (手持设备)		
Mobile phones (手机)		
Mobile-assisted language learning (移动辅助语言学习)		

- (2) Time and location range: The research studies were conducted in mainland China, and the publication timeframe was limited between 2015 and 2020.
- (3) Empirical studies: The publications were empirical studies that contributed to observed and measured experience or experiment, including specific research questions to answer, populations to study, data to collect and analyse, results to report, and findings to discuss (Goodwin, 2005). However, the publications exclusively investigating user perceptions, attitudes, and beliefs were not considered.
- (4) Requirements for peer review: The publications were peer-reviewed, as objective and independent expert reviews help ensure the studies would have high quality and impact (Zhou, 2020).
- (5) Publication types and languages: Only journal articles written in English or Chinese were included. Conference proceedings, books, and book chapters were excluded.
- (6) Full texts: Only literature with full texts available were included.

Consequently, a total of 148 potentially relevant studies were then analysed through an abstract review. As illustrated in Figs. 2, 103 articles were removed, leaving 45 eligible. The full texts were then scanned to determine whether these studies met all the inclusion selection criteria. Of these 45 studies, 22 studies were eliminated, and 23 studies were eligible for the systematic analysis. The detailed search and selection processes were shown in Fig. 2.

6.3 Data analysis and coding

The selected publications were coded to answer the research questions. More specifically, the following elements were examined to answer Research Question One.

- 1) Research purposes: the research questions to be addressed;
- 2) Learning outcomes: impacts of m-learning on participants' L2 learning;
- 3) Target language teaching areas: the most frequently researched language skill(s);
- 4) Educational contexts: classroom, non-classroom, and a mixed setting; and
- 5) Types of applications/software: the platforms where m-learning was conducted on L2 learning.

With regard to Research Question Two, the selected studies were reviewed and coded guided by the two original SLT components.

7 Results

This section draws detailed discussions of the analysis results to provide a thorough picture of the reviewed studies.

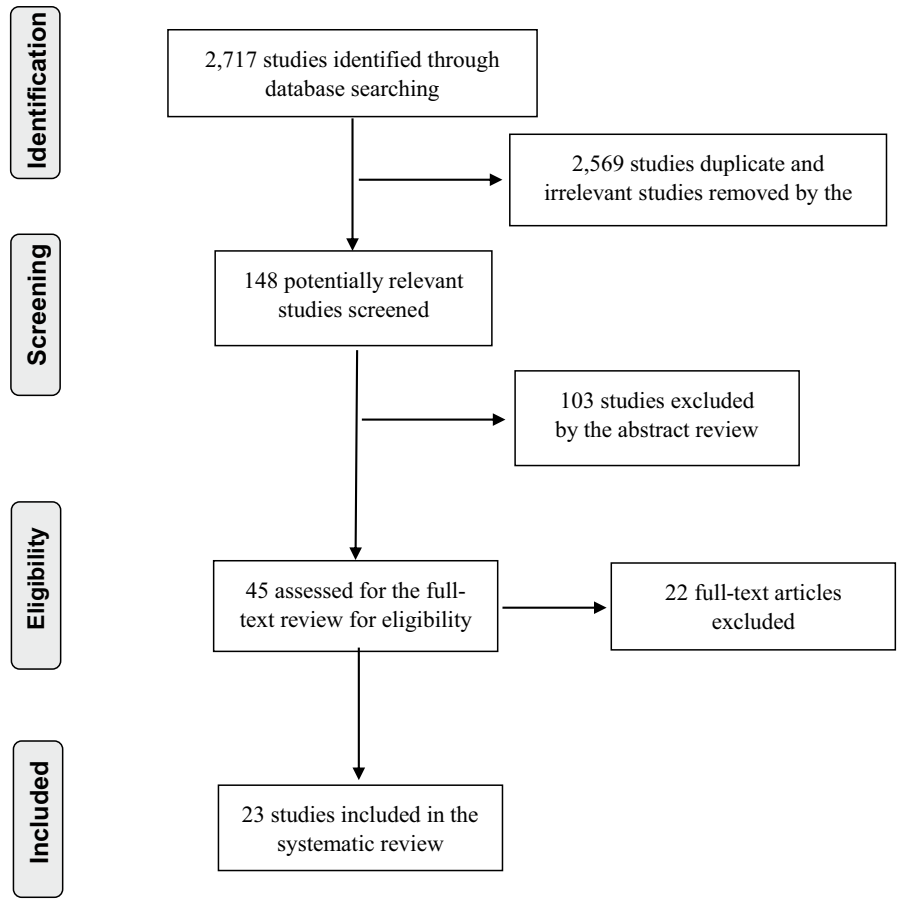


Fig. 2 The literature search and selection process

7.1 Findings to research question one

This section will give an account of the descriptive data generated from the 23 reviewed studies. Figure 3 indicates the trend of publication years between 2015 and 2020. As can be seen, 2019 witnessed the highest number of publications (n=10) relevant to the chosen topic, followed by 2020 (n=5). This publication trend was also true in international contexts that there has been a growth of MALL studies since 2015, owing to the popularisation and development of mobile technologies (Elaish et al., 2017). In this section, each research element mentioned in the first research question will be explained with references to the specific reviewed studies. Most reviewed studies reported more than one researched element. Table 2 provides an overview of several major researched elements in the 23 reviewed studies from three aspects: target language teaching

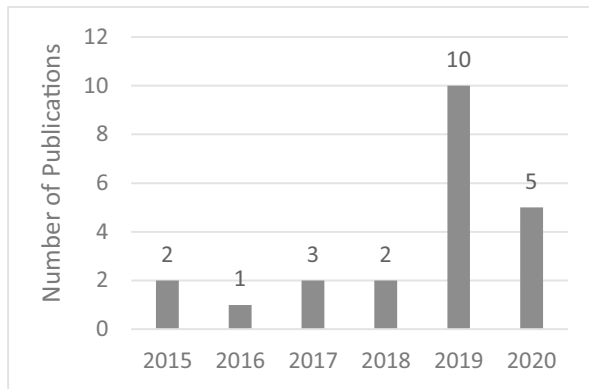


Fig. 3 Publication years of the 23 eligible studies between 2015 and 2020

areas, educational contexts, and types of applications/software in use. These studies were labelled with numbers and presented in chronological sequences.

7.1.1 Research purposes

In respect of the research purposes, 17 studies (studies No.1, 2, 4–6, 9, 12, 13, 15–23), assessed the effectiveness of MALL for specific learning and teaching aims. Of these 17 studies, 15 studies investigated MALL effectiveness in facilitating language learning outcomes ($n=14$) (studies No.1, 2, 4–7, 12, 13, 15–19, and 21) and enhancing language retention ($n=2$) (studies No.12 and 20). Two studies (No.22 and 23) discovered MALL promoted students' psychological constructs, including conformity behaviour and self-esteem, through their engagement in mobile English learning activities (No.22) and collaboration by team-based MALL activities (No.23). Nine studies investigated how m-learning benefited various academic abilities regarding L2 learning (studies No.3, 5, 10, 13, 15, 19–21, and 23). For example, the studies probed into self-regulated learning (No.21), self-directed and self-paced learning (No.19), learning autonomy (No.3 and 13), and collaborative learning (No.15 and 23). Learning motivation (No.5, 19, and 20) and target-culture adjustment (No.10) were also discussed. Five studies (studies No.8, 9, 11, 14, and 22) investigated MALL-based educational modes, e.g., a technology acceptance model (No.22), an interactive and blended learning approach (No.14), a problem-based learning method (No.11), a SAMR (Substitution, Augmentation, Modification, and Redefinition) model (No.9), and a flipped classroom model (No.8). MALL-based pedagogical and educational models were also explored ($n=4$), including a contribution-oriented self-directed mobile learning ecology model (No.20), a WeChat-assisted language learning model (No.22), a blended teaching model (No.14), and a collaborative learning platform (No.15).

Table 2 Overview of the 23 reviewed studies

No.	Studies	Target teaching areas	Educational contexts	Apps/software
1	Wu (2015a)	English vocabulary	Informal	Self-designed application
2	Wu (2015b)	English vocabulary	Informal	Not specified
3	Li and Li (2016)	Not specified	Mixed	A recording program
4	Mason and Zhang (2017)	Chinese characters	Not given	E-dictionary
5	Shi et al. (2017)	English vocabulary, grammar, listening, speaking, and writing	Informal	WeChat
6	Xu and Peng (2017)	Chinese speaking	Informal	WeChat
7	Dai et al. (2018)	Not specified	Informal	WeChat
8	Ye et al. (2018)	English speaking	Mixed	WeChat
9	Chen (2019)	English listening & speaking	Formal	Not specified
10	Dong, Cheng, Dong, and Wu (2019)	Not specified	Informal	WeChat
11	Li (2019)	Not specified	Mixed	Not specified
12	Ma and Butsakorn (2019)	English vocabulary	Mixed	Self-designed application
13	Wang and Liu (2019)	English vocabulary	Informal	Two educational applications
14	Wu (2019)	English vocabulary, translation & grammar	Mixed	WeChat
15	Yan (2019)	English writing	Informal	WeChat
16	Liu et al. (2019)	English speaking	Mixed	An educational application
17	Yu et al. (2019)	Overall (TOEFL test)	Informal	A self-designed application
18	Zhao (2019b)	Not specified	Informal	WeChat & QQ
19	Wang (2020)	English vocabulary	Informal	Baiczhan APP
20	Wang et al. (2020)	English vocabulary	Mixed	WeChat
21	Xu (2020)	English listening & speaking	Informal	Keke English learning APP
22	Yu (2020)	Not specified	Mixed	WeChat
23	Zhu and Wang (2020)	Not specified	Mixed	Moso Teach (mobile version)

7.1.2 Learning outcomes

Nineteen studies presented positive student learning outcomes, except for studies No.8, 18, 22, and 23. In these studies, mobile devices successfully facilitated students' foreign language learning performances, except for one study reporting effects in listening (No.21). However, this study also showed that MALL approaches did not significantly impact speaking skills, although the other studies reported positive findings of mobile-assisted speaking learning outcomes (studies No.5, 6, 8, 9, 16, and 17). The results were congruent with the international evidence that MALL generally yielded satisfactory learning outcomes (Su & Zou, 2020).

7.1.3 Teaching areas

The most researched target language teaching area was vocabulary ($n=9$) (studies No.1, 2, 5, 12–14, 17, 19, and 20), followed by speaking ($n=7$) (studies No.5, 6, 8, 9, 16, 17, and 21). Similar to the findings in many other international MALL publications, vocabulary has received the most emphasis (Persson & Nouri, 2018). The review reveals that vocabulary learning can be more effectively facilitated using technological advances (Hu, 2013), because this learning area relies on situated and collaborative activities (Sharples, 2000). However, this result contradicts with Hu and Shen (2014)'s results that most Chinese MALL studies focused on overall language proficiency. The present study yielded the same findings consistent with the existing results that English is the most investigated MALL language (Shadiev & Yang, 2020).

7.1.4 Educational contexts

As for educational contexts, 12 studies explored MALL implementations in a non-classroom context (studies No.1, 2, 5–7, 10, 13, 15, 17–19, and 21), followed by nine studies in a mixed setting. Examples were studies No.3, 8, 11, 12, 14, 16, 20, 22, and 23. Only one study was conducted in the classroom (No.9). The findings echoed previous claims that MALL had more robust effects in informal and mixed settings (Sung et al., 2015), because mobile technologies supported learning across different learning contexts (Ozdamli & Cavus, 2011). However, some previous investigations yielded different results that MALL studies in international contexts were primarily concerned with MALL in formal HE environments (Persson & Nouri, 2018).

7.1.5 Types of applications

Mobile phones/smartphones were used in 22 studies to deliver learning content or interventions. Only one study (No.11) did not specify the device types being used. However, these 22 studies lacked of detailed account of the device types used. Mobile phones/smartphones outperformed other handheld devices because they effectively connected learners with learning, delivered learning content, and made learning ubiquitous (Taj et al., 2016). Ten studies used social applications, especially WeChat (studies No.5–8, 10, 14, 15, 18, 20, and 22). WeChat has been the

most popular mobile phone application in China, in both universities and colleges, and among both teachers and students (Du, 2018). There has also been a boost in WeChat-based English learning and teaching studies in Chinese universities (K. Y. Sung & Poole, 2017). In addition, other types of applications/software were mentioned ($n=10$), including educational applications (studies No.13, 16, 19, 21, and 23), self-developed/self-designed applications (studies No.1, 12, and 17), e-dictionary applications (No.4), and built-in recorders (No.3). Some international literature evidenced that applications developed for educational purposes had better effects because they met learner needs and achieved pedagogical goals (Chen et al., 2020). Vocabulary learning applications and e-dictionaries were reviewed as the most compatible types of applications/software for vocabulary acquisition (Zhang & Pérez-Paredes, 2021). However, only five reviewed studies (studies No.1, 4, 12, 13, and 19) applied applications/software purposively designed for vocabulary acquisition (studies No.1, 4, 12, 13, and 19).

7.2 Findings to research question two

The second research question investigated how the two original SLT components, that is, LPP and CoPs, had a bearing on MALL. The two elements will be addressed in the following paragraphs with references to the 23 studies presented based on denoted factors in LPP and CoPs in Table 3.

7.2.1 Legitimate peripheral participation (LPP)

By LLP, learners acquire knowledge, master skills, and construct identities in real-world practice, and they will gradually develop from peripheral to full participants through interacting with total participants (Lave & Wenger, 1991). In other words, learning is constituted in a lived-in world that is socially constructed. Newcomers achieve learning through learning from and with experienced members. The studies in this systematic review reveal that LPP supports MALL through three aspects: authenticity, social interactions, and apprenticeship learning. These are unpacked in the sections below.

Authenticity Ten of the reviewed studies connected to authenticity (studies No.3, 7, 8, 13, 15–17, 19, 21, and 23). It is believed that learning should be embedded in authentic situations in which relevant activities take place (Kissinger, 2013). Mobile online platforms and educational programs contextualised language learning and students in place-based situations. For example, students engaged in audio, visual, and verbal resources that simulated real-world language-related situations (such as No.7). Some of the included studies provided actual language environments, such as paired and group activities resembling real-life communicative events (such as No.17), and learning communities virtualising natural language use and tasks (such as No.19). Students involved in these studies thus acquired, developed, and used language in the mould mirroring real-world contexts.

Table 3 The 23 reviewed studies and denoted SLT elements

No.	Studies	Denoted elements in LLP	Denoted elements in CoPs
1	Wu (2015a)	Apprenticeship learning	Authenticity
2	Wu (2015b)	Apprenticeship learning	Authenticity
3	Li and Li (2016)	Authenticity; Social interactions	Interpersonal activities; Beliefs & behaviours
4	Mason and Zhang (2017)	Not Applicable	Authenticity
5	Shi et al. (2017)	Not Applicable	Interpersonal activities
6	Xu and Peng (2017)	Social interactions	Authenticity; Beliefs & behaviours
7	Dai et al. (2018)	Authenticity; Social interactions	Interpersonal activities
8	Ye et al. (2018)	Social interactions; Apprenticeship learning	Interpersonal activities; Beliefs & behaviours
9	Chen (2019)	Social interactions; Apprenticeship learning	Beliefs & behaviours
10	Dong et al. (2019)	Social interactions; Apprenticeship learning	Authenticity; Interpersonal activities; Beliefs & behaviours
11	Li (2019)	Social interactions	Interpersonal activities
12	Ma and Butsakorn (2019)	Apprenticeship learning;	Not Applicable
13	Wang and Liu (2019)	Authenticity; Social interactions; Apprenticeship learning	Interpersonal activities
14	Wu (2019)	Social interactions; Apprenticeship learning	Interpersonal activities
15	Yan (2019)	Authenticity; Social interactions; Apprenticeship learning	Interpersonal activities; Beliefs & behaviours
16	Liu et al. (2019)	Authenticity; Social interactions; Apprenticeship learning	Authenticity; Interpersonal activities
17	Yu et al. (2019)	Social interactions; Apprenticeship learning	Not Applicable
18	Zhao (2019a)	Social interactions; Apprenticeship learning	Interpersonal activities; Beliefs & behaviours
19	Wang (2020)	Authenticity; Social interactions; Apprenticeship learning	Interpersonal activities
20	Wang et al. (2020)	Social interactions; Apprenticeship learning	Interpersonal activities; Beliefs & behaviours
21	Q. Xu (2020)	Authenticity	Interpersonal activities
22	Yu (2020)	Social interactions; Apprenticeship learning	Interpersonal activities; Beliefs & behaviours
23	Zhu and Wang (2020)	Social interactions	Interpersonal activities; Beliefs & behaviours

Social interactions Seventeen of the reviewed studies created social interactions (studies No.4, 6–11, 13–20, 22, and 23). As a social practice, learning is characterised social, and it takes place in a socially-constructed world (Lave & Wenger, 1991). Mobile devices and social applications established socially-networked contexts in which students socialised with others. One example was that No.7 empowered social encounters among students by inventing social-media platforms. Similarly, students had more opportunities to get to know one another (such as No.11), owing to the social contacts in virtualised communication-oriented groups (such as No.14). Students could communicate with individual members in these studies and complete social tasks and events in such socially-built settings.

Apprenticeship learning Fifteen of the reviewed studies arranged apprenticeship learning (studies No.1, 2, 8–10, 12–20, and 22). Learning is advanced and realised through a dynamic process of learners' roles as novices (Gablinske, 2014). Mobile technologies allowed for students' increasing participation in language practice by an active process of peripherality. For example, a series of English-learning events, including successive learning loops, benign learning cycles, and student-organised and peer-assisted learning groups, enabled low-achieving students or beginners to learn with/from successful students or experts (such as No.8). They gradually improved language proficiency through their ongoing immersion (such as No.9). Once students achieved learning, they could gear towards helping others (such as No.10).

7.2.2 Communities of practice (CoPs)

CoPs refer to contexts in which members participate jointly in ongoing activities through interacting with community members regarding shared goals of practical issues (Orgill, 2007). Due to the connections to groups, they acquire knowledge, develop sociocultural abilities, and modify their characters and habits. That is, learners learn from and with other members for common problems or goals embedded in real-life usage. Also, learners can learn cultures, values, and norms through engagement in the community. This review identifies that CoPs support MALL from three aspects: authenticity, interpersonal activities, and beliefs and behaviours.

Authenticity Six of the reviewed studies coupled with authenticity (studies No.1, 2, 4, 6, 10, and 16). The ultimate goal of acquiring knowledge is to use it for practical purposes (Palalas, 2011). Social applications and mobile-based services integrated students' learning with their actual expectations. An example of this is international Chinese learners embedded Chinese-character learning with specific topics, such as personal career planning (such as No.4), daily social events, and interpersonal contacts (such as No.10). Following practical English vocabulary skills, non-English majors primarily focused on spelling, pronunciations, and Chinese definitions (such as No.1 and 2). Students could gain practical language knowledge when learning was contextualised within true-to-life purposes.

Interpersonal activities Sixteen of the reviewed studies organised interpersonal activities (studies No.3, 5, 7, 8, 10, 11, 13–16, 18–23). Students are interconnected with other practitioners, as they have the same learning goal (Sharples et al., 2007). For instance, No.5 designed synchronous and asynchronous peer-assisted interactivities for students to work on the same learning tasks. Similarly, No.16 delivered collaborative activities, such as group discussions and reports. Cooperating on assigned tasks provided students ample encouragement and active help from teachers and peers (such as No.10). Hence, students would possibly achieve better outcomes.

Beliefs and behaviours Ten of the reviewed studies mediated beliefs and behaviours (studies No.3, 6, 8, 9, 10, 15, 18, 20, 22, and 23). Community-based activities had impacts on learners' mindsets and performances due to sociocultural immersion in community activities (Kozulin et al., 2003). Students gained sociocultural knowledge from group mobile-assisted language events. No.6 found that international students improved sociocultural competencies by acquiring Chinese cultures and customs through contacts with native Chinese in networking activities. Additionally, students cultivated positive personality traits including integrity and selflessness (such as No.20), and developed positive behavioural patterns such as teamwork and collectivism in online team activities (Ye et al., 2018).

8 Discussions

8.1 Major identified research issues

The year 2015 marked a tremendous boost in the volume of MALL publications in mainland China's HE contexts. Various established learning theories and models were adopted in Chinese MALL studies, including constructivism (such as No.18), the sociocultural theory (such as No.14), and the technology acceptance model (such as No.22). Chinese researchers showed preferences to measure the impact of MALL on language learning performances using quantitative approaches. Nevertheless, nearly all the reviewed studies reported positive effects, particularly on L2 linguistic proficiency. However, variables contributing positive results were not identified. Meanwhile, different language skills involving pronunciations and grammar are under-researched (as in No.5 and 14). Besides, MALL in informal and mixed settings is prevalent among all reviewed studies. Yet, there is inadequate empirical evidence regarding MALL practice implemented in formal classroom contexts (as in No.9). Mobile phones or smartphones are the most used handheld devices and WeChat is the most adopted application/software in the selected publications.

8.2 Four derived elements from the SLT

Four derived elements were identified from the two original SLT components: authenticity, social interactions and collaborations, apprenticeship learning, and

beliefs and behaviours. Figure 4 presents the intertwined relationships between these elements.

The first derived element in the central position in Fig. 4 is “Authenticity”. It has the highest complexity among the four. As discussed earlier, the two original components both lead to “Authenticity”, because learning in authentic situations involves learners’ growing participation. It occurs in contexts in which members work jointly on shared practical goals. Also, “Authenticity” is interconnected with the other three derived elements, as they are all characterised authentic.

The second derived element at the middle of the bottom row is “Social Interactions and Collaborations”. It is generated from the two original components. Learners perform and achieve learning through changing participation in socially-constructed settings (Lave & Wenger, 1991). It shares a reciprocal relationship with “Authenticity”. Learning in socially-connective contexts is characterised as authentic. This element also connects to the other three derived ones because they all involve social and interactive processes.

The third element “Apprenticeship Learning” is on the bottom left, originated from LPP and “Social Interactions and Collaborations”. It also interrelates with “Authenticity”. Real-world learning scenarios involve changing practice in which beginners or disadvantaged learners gradually turn advanced/successful by constant engagement in learning with and from advanced/successful learners (Li et al., 2018).

The fourth element is “Beliefs and Behaviours” situated on the bottom right, arisen from CoPs and “Social Interactions and Collaborations”. The same as Apprenticeship Learning, this element also correlates with “Authenticity”. Learners acquire sociocultural knowledge, develop personality traits, and shape habits in community-based interactivities which mould authentic situations (Arnseth, 2008).

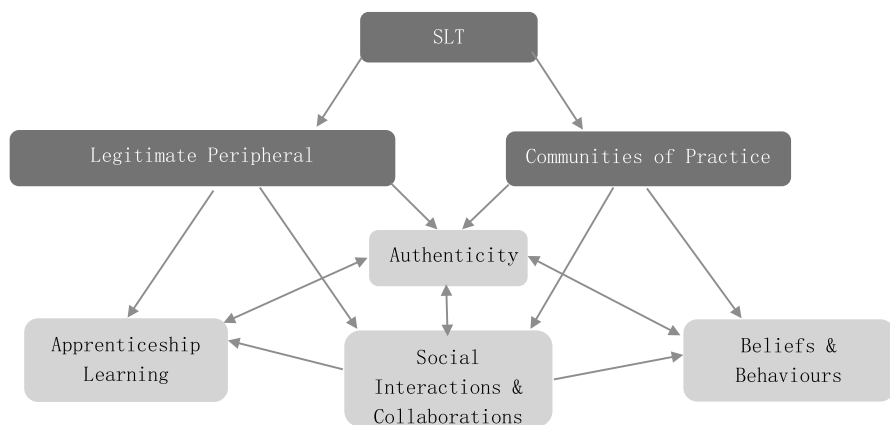


Fig. 4 Relationships of all the six SLT elements adapted from Lave and Wenger (1991)

8.3 Implications for MALL-based pedagogical practices

From a pedagogical perspective, implications resulting from this systematic review are anticipated to inform language instructors on improving teaching practice and, by extension, enhancing their students' learning. MALL-based language learning must be situated in real-world contexts and must be linked to its true-to-life usage. Mobile technologies empower learners to conduct and achieve language learning in real life-simulating activities and settings. Additionally, language learning should remain contextualised in place-based issues centred on language, because it serves real-life purposes regarding language use (Palalas, 2011). Accessing practical situations and events allows learners to be better prepared for actual language-related matters in broader settings.

This review shows that MALL-based language learning relies on socially-constructed settings and interpersonal activities. Mobile technologies bridge individual learners in networked communities to engage jointly in shared language-related activities through social contacts. Meanwhile, learners, correlated with such socially-built environments, gain sociocultural knowledge by complete immersion. In addition, learners master and achieve language learning in joint learning events. They get stimulated to interact and participate in learning due to the raised motivation and enjoyment and mitigated embarrassment and stress (Kukulska-Hulme & Viberg, 2018).

The findings suggest that MALL-based language learning can be accomplished in the dynamic engagement and sociocultural immersion. Learners gradually develop learning by increasing participation (Ibáñez et al., 2011). Mobile technologies allow beginning level learners to learn with and from advanced learners as apprentices. They will eventually become accomplished learners themselves. Moreover, learners can cultivate personality traits and shape behavioural patterns within ongoing language-related practices and by interpersonal contacts. Communicating closely with partners and staying connected to groups can foster their metacognitive abilities and cultural qualities.

8.4 Suggestions for future MALL research

Given the purpose of the study, the following four points should be taken into account in the future. Firstly, future reviews can further examine and validate the four derived elements proposed in this study. Secondly, it would be paramount to synthesise MALL in two or more regions comparatively. For example, Taiwan, highly active and interested in MALL (Su & Zou, 2020), has similarities with and differences from mainland China's educational systems/modes. Finally, future research should systematically synthesise WeChat pedagogical functions in MALL, given the growing adoption in using this tool.

9 Limitations

This review study has certain limitations. First, the number of eligibly reviewed studies was small ($n=23$). This study primarily investigated the MALL studies in mainland China's HE contexts between 2015 and 2020. Broader review time and location ranges could potentially lead to more representative results. Some seemingly eligible studies had been removed because of the inconsistency in their validity and reliability (Wang & Cui, 2016). Second, this review study only screened journal articles. Wider publication types, such as conference proceedings, books, and book chapters, and dissertations, may provide in-depth insights into the constructs of interest. Third, the search process involved seven large databases which had a wide coverage on the chosen topic. However, other research databases may engender rich outcomes on relevant articles. Also, additional search terms and term combinations may produce additional search findings. Last, the five coded researched elements were relatively subjective. They were considered based on the authors' selection and preferences. Studies regarding different researched aspects could be performed to tackle a larger scope of MALL research aims.

10 Conclusion

The present systematic review synthesised 23 MALL studies in the Chinese HE context published from 2015 to 2020. The research synthesis first identified several common themes shared by these studies. More specifically, the results illustrated that MALL effectiveness for L2 learning was the most researched question. Most reviewed studies reported that mobile devices successfully facilitated students' language learning outcomes. In particular, vocabulary acquisition was the most investigated language teaching area. An informal context was the most popular educational setting for MALL practice. Mobile phones/smartphones were the most used devices, and social applications/software, particularly WeChat, were the most used tool.

This study endeavoured to probe into how the two original SLT components (LPP and CoPs) had a bearing on MALL in Chinese HE settings. Four elements were further derived from the two, namely authenticity, social interactions and collaborations, apprenticeship learning, and beliefs and behaviours. In sum, this study signalled the need to further understand MALL in the chosen context, especially related synthesis studies. More importantly, several significant findings of this review are expected to shed light on the implementation of MALL-based pedagogies at tertiary education levels in mainland China and beyond.

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