

Exploring Mobile Technologies for Learning Chinese

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Abstract

The present study aimed to reveal how learners of Chinese as a foreign language use mobile technology to study Chinese outside the classroom. Researchers used sociocultural perspectives to frame the study and grounded theory to analyze data. Eleven English-speaking students who had learned Chinese for different years at a mid-western university participated in the study. They answered 23 major questions by submitting journal entries and participating in an interview.

Compared with computer assisted language learning, mobile devices bring changes to tutorial functions, social computing, and gaming. Participants heavily explored tutorial functions, used mobile devices differently from computers for social computing, and showed interest in gaming. Although participants were enthusiastic about using mobile devices to learn Chinese, the number of applications they used and the variety of activities they engaged in were limited. Findings suggest that the effective incorporation of mobile devices to learn Chinese depends on collaboration and scaffolding.

Introduction

Mobile technologies are becoming more accessible and popular. Meanwhile, the number of students learning Chinese as a foreign language (CFL) has increased steadily. More than 60,000 students studied Chinese at American colleges and universities in the fall of 2009, representing an increase of more than 18% since 2006 (Modern Language Association, 2010). Within this context, it is crucial to consider the role mobile devices might play in helping students to learn Chinese. Researchers in the field of computer assisted language learning (CALL) agree that the use of technology in specific language learning situations is more significant than the technology itself (Kern,

2006). The purpose of this study was to explore how CFL learners use mobile devices to learn Chinese.

Literature Review

Blake (2011) describes CALL in terms of the following three categories: “tutorial CALL, social computing CALL, and CALL gaming” (p. 21). Blake summarizes that tutorial CALL is conducive to vocabulary development. Within tutorial CALL, Blake also discusses the availability of some programs for intelligent CALL, which can specifically respond to individuals. In terms of social computing CALL, Blake notes that computer-mediated communication (CMC) has been a focus of study. Synchronous CMC means students engage in communication through the use of computers at the same time. Earlier studies by Beauvois (1992), Chun (1994), Kelm (1992), and Kern (1995) provide evidence of synchronous CMC facilitating language learning. As to gaming, Blake (2011) characterizes it “as a viable way to stimulate learning a second language” (p.27).

Sociocultural Theory

Taking the socio-cognitive approach, Kern, Ware, and Warschauer (2004) summarize CALL research into “three key themes: (1) linguistic interaction, (2) intercultural learning, and (3) literacy and identity” (p. 244). Warschauer (2005) applies Vygotsky’s theories of learning to CALL and concludes that “mediation, social learning, and genetic analysis” (p. 41) are all of great relevance. From sociocultural theory into the field of second language acquisition, Lantolf and Thorne (2006) introduce key concepts, “namely mediation and regulation, internalization, and the zone of proximal development ...” (p. 216).

Kern (2006) argues for diversified theoretical frameworks for CALL. For sociocultural theory, he points out that it focuses on “the social and cultural situatedness of learner activity, learners’ agency in co-constructing meanings (as well as their own roles), and the importance of mediation by tools and signs” (p. 187). Blyth (2008) summarizes four major theoretical frameworks for CMC research: “technological, psycholinguistic, sociocultural, and ecological” (p. 55). Because sociocultural theory constitutes an important framework for

CALL research, the interpretation of data in the present study is framed by sociocultural perspectives.

Mobile Devices and Language learning

Mobile technology brings its own special features. Chinnery (2006) discusses the availability and portability of mobile devices and also identifies some accompanying problems. Godwin-Jones (2011) points out the new features of mobile devices and the importance of their associated software.

Various studies have investigated the use of mobile technology for language learning. Kukulska-Hulme and Shield (2008) summarize that mobile research has focused on either content (i.e., “the development of activity types and learning materials,” p. 274) or design (i.e., “design issues and learner needs,” p. 278). They point out that content-related research has focused on studies which delivered materials to students without studying “learner collaboration or communication,” while design-related research does not fully explore the unique features of mobile devices (p. 280). Stockwell (2010) compares the use of mobile devices to that of computers. He finds no major distinctions between the two kinds of devices in terms of student learning although mobile devices require more time than computers. He further asserts that “mobile learning for language learning has reached a stage where it is starting to move out of the classroom and into the real world” (p. 107). Lan, Sung, and Chang (2007) conclude that mobile devices can help learners of English as a second language collaborate in reading in addition to bringing other benefits. As suggested by Kukulska-Hulme (2007), the ways people actually use mobile technology will ultimately determine its effectiveness.

CALL for Learning Chinese

Because of specific features of character orthography, pronunciation, and meaning (detailed in Wang & Leland, 2011), learning characters and words requires a lot of time for CFL learners whose native languages use Roman alphabetic letters. Consequently, research has focused on tutorial CALL, with CMC and gaming yet to be explored further. Specifically, researchers conclude that e-dictionaries (i.e., an online pop-up dictionary) can help beginning

CFL learners improve reading and comprehension of simple materials (Wang & Upton, 2012), and e-dictionaries (i.e., an application that is downloaded) can help intermediate CFL learners learn vocabulary and improve reading comprehension (Wang, 2011).

Mobile devices also bring interesting features to the study of Chinese. Godwin-Jones (2011) describes the possibility of using one's finger to write characters on the screen and typing pinyin to input characters into mobile devices. The feature of finger writing characters is unique to mobile devices. The existence of innovations underscores the importance of studying learners' self-initiated activities related to language learning outside the classroom.

Methods

Participants

Participants came from a large urban university in the Midwest. The university provides excellent infrastructure for technology use. Besides taking Chinese language courses on campus, students can study abroad in China through the summer study abroad or regular semester programs. Students also have chances to interact with native Chinese speakers on campus.

Around 50 students who were taking, or had recently taken, Chinese language courses were contacted about the research project of studying the use of mobile devices for learning Chinese. Fifteen out of the 50 students (around 30%) stated that they had used mobile devices to learn Chinese, and 13 of them actually signed the consent forms and were offered a stipend. At the end of the study, 11 participants answered questions in six journals and in an interview and were given another stipend.

The 11 participants, four females and seven males, came from seven Chinese language courses ranging from the first to the third year of language learning. Specifically, two were in the first year of language study, five were in the second year, and four were in the third year. Some of the participants had studied abroad either in mainland China or Taiwan. Among the 11 participants, there was one heritage learner who came to the U.S. at an early age. In summary, the participants represented the students who used mobile devices for learning Chinese at that university well.

Methodology

The present study uses grounded theory, which is described as “the discovery of theory from data” by Glaser and Strauss (1967, p. 1). Grounded theory is a research method based on “inductive strategies of theory development” (Patton, 2002, p. 125). The main steps of this method are as follows: “Data go to concepts, and concepts get transcended to a core variable, which is the underlying pattern” (Glaser, 2000, p. 840). Grounded theory methodology has been used widely in a variety of disciplines, and it is beginning to be adopted by researchers in second language acquisition. For example, this method has been used to study learners’ perceptions on effective activities to learn Chinese characters (Wang & Leland, 2011).

“Grounded theory depends on methods that take the researcher into and close to the real world so that the results and findings are grounded in the empirical world” (Patton, 2002, p. 125). Applying grounded theory methodology, the two researchers in the present study worked closely with the participants so that their understanding of the research area was situated in the reality of the use of mobile technology.

As a starting point, the researchers were interested in knowing some basic features of mobile devices for learning Chinese. Subsequently, their main focus was to find out how students use mobile devices to facilitate their learning of Chinese. They generated some initial questions and met regularly to raise more questions in the process of doing the study. Based on the existing literature, their research goals, and student responses, the researchers generated 23 major questions. The questions mainly asked students about the kinds of mobile devices and applications they use, the frequency of usage, the reasons for using the applications, their main activities related to learning Chinese, their perceptions about the effects of applications on learning Chinese, the advantages and disadvantages of using mobile devices, and their knowledge of specific applications and plans to use them in the future.

Procedure for Data Collection

During a fall semester, one researcher created a project site on the university's existing course management system and added all the participants in the study. Every week, she posted three or four questions on the site and asked participants to answer them. In addition, she piloted potential questions with one student to determine their appropriateness and to seek additional information. She asked all of the 11 participants two questions. When she was not clear about journal answers, she sought clarification with the specific students. In the following, pseudonyms are used for student participants. The whole project lasted for about five months.

Results

Responses from the 11 participants to journal and interview questions revealed that they used different mobile devices such as iPhone, iPod touch, Android, Blackberry, and iPad. Some of them had more than one device and most of them used mobile phones. Based on participants' journal responses and the transcripts of additional interviews, four themes emerged.

Theme One: Participants were Enthusiastic about Mobile Technology

Participants pointed out that mobile devices were convenient, easy to use, fun, and offered innovative features. In addition, they stated that mobile devices were effective for learning Chinese.

Convenient. Participants pointed out the convenience of using mobile devices. In answering the question "What are the advantages of using mobile technology to learn Chinese?" (week 12), ten participants pointed out the convenience of mobile devices. For example, Gil wrote, "I don't have to carry around several heavy books everywhere I go, I can use it anytime and anywhere, and it is easy to begin studying by just opening an application." In an interview, Abbi said that mobile devices suited the life style of college students because "most of us college students are mobile."

Easy to use. Participants also noted that they could easily get the meaning and pronunciation of unknown characters from mobile devices. In answering the question “How do you look up an unknown character in the mobile devices?” (week 10), nine students reported that they used their fingers to write the unknown characters on the screen, and then got the meaning and pronunciation. In answering the question “Generally speaking, how do you feel about using mobile technology to help you study Chinese?” (week 12), Simon wrote, “Personally, I wouldn’t know how to even begin how to use traditional Chinese language dictionaries.” During an interview, Lisa demonstrated that it only took her 15 seconds to identify an unknown character on her iPhone.

Fun. In addition, some participants noted that it was fun to use some applications. In answering the question “What are the advantages of using mobile technology to learn Chinese?” (week 12), Jay stated it was “a fun and innovative way to connect the youths of today in learning a language.” In answering the question “Which mobile devices do you see as being most useful to students at various proficiency levels?” (week 12), Gale answered, “I believe the I-phone is the most useful mobile devices for studying ChineseNot only do they have educational applications, but also students can play games in Chinese.”

During interviews, some participants demonstrated specific applications they saw as fun to play with. For example, Lisa demonstrated the application of “trainchinese Chinese Writer: Learn Characters by Playing.” She said she was excited to play the game and mentioned that other students who saw the game also wanted to play it.

Innovative. Some participants noted the innovative features of mobile devices for connecting oral with written language. In answering the question “Have you explored any unconventional uses of mobile devices and applications in studying Chinese? If so, please describe these experiences” (week 12), Gale replied:

Google has an application for the iphone that you can speak either Chinese or English into the mobile, and it will translate to the other language. Sometimes I will use this application with

a Chinese student if we can't figure out how a word should be said or written [*siz*].

Two students also wrote about using mobile devices to watch TV or movies in Chinese. For example, in answering the question "For what activities do you use mobile technology for learning Chinese?" (weeks 8-9), Jay answered as follows:

The reason I use video streaming sites such as Tudou and Youtube is because I use it [*siz*] to learn Chinese from the news, songs, and learning programs on them. I also stream Chinese movies from them to improve my Chinese.

Effective. More than half of the participants reported that the use of mobile devices improved their language learning. In answering the question "What are the total effects of using mobile devices for learning Chinese?" (week 13), seven clearly pointed out that the use of mobile devices improved their learning of Chinese. For example, Jay wrote:

Due to the convenience in using mobile devices, I find learning Chinese to be much easier because it is a much more contemporary method to learn a language. It is using something that youths of today are familiar with and making it much more integrative and innovative to learning Chinese.

Specifically, some participants reported that it is highly likely that they will remember the characters they looked up. In answering the question "What is the likelihood that you will recognize the character when you encounter it at a later date?" (week 10), five participants wrote that it would be very likely that they would recognize the characters they looked up.

Theme Two: Participants Mainly Used Mobile Devices for Quick Reference and Sometimes for Practice

In terms of how participants used mobile devices to learn Chinese, the data suggest that they did not fully make use of the special features offered by mobile devices. Participants were limited in their use of applications to learn Chinese. They mainly used

dictionary and translation applications for quick reference to help with course assignments or overcome communication and comprehension barriers. Sometimes they used mobile devices to practice vocabulary, pinyin, and Chinese numbers.

Applications. Participants frequently used dictionary and translation applications, but used other applications less often. In answering the question “On your mobile devices, what applications (e.g., e-dictionary, etc.) do you use?” (weeks 8-9), with the possibility of using more than one application, ten mentioned the use of a dictionary, three mentioned a translator, and two mentioned a flash card application. Other applications were mentioned only once.

Participants used the same dictionary applications. In answering the question “On your mobile devices, what applications (e.g., e-dictionary, etc.) do you use?” (weeks 8-9), nearly all iPhone (iPod touch) users talked about KTdict C-E, while all Android users wrote about the Hanping Dictionary. They specifically mentioned that KTdict C-E is free and very easy to use.

Quick reference. Participants mainly used mobile devices to identify unknown characters and get Chinese words from English or pinyin. In answering the question “For what activities do you use mobile technology for the learning of the Chinese language?” (weeks 8-9), with the possibility of engaging in more than one activity, eight wrote about looking up unknown characters and words, five wrote about translating English into Chinese, three mentioned memorizing characters, and two referred to texting or typing in Chinese. For example, Simon wrote:

I usually use these applications to search for the meaning of certain characters I have not encountered before. I also type in pinyin sometimes for the characters I forget how to write. When I need to make a sentence, sometimes I need to look for words I know in English but not in Chinese...

Participants mainly used mobile devices to aid in course assignments. All of the students indicated either in interviews or journal responses that they used mobile devices for coursework. For

example, in answering the question “How often do you use mobile devices to learn Chinese?” (weeks 8-9), Gwen wrote, “I usually use my phone at least every time I work on my homework in the workbook. Even if I can finish my homework without my phone, I still like to use it to check my work.”

In addition, six participants clearly expressed in either interviews or journal responses that they used mobile devices to overcome communication barriers. Some participants stated that they used mobile applications to find Chinese words they needed in the process of oral communication. Simon said in the interview that he used his mobile devices to find Chinese words when he communicated with someone who did not know English. Some participants used mobile applications to get the meaning and the written form of a word when they heard it during face-to-face conversation. For example, in responding to the prompt “Describe the ways you use mobile devices to learn Chinese by interacting with people” (week 13), Gale wrote, “I usually hand my iphone to other people to write the Chinese character into my iphone’s Chinese dictionary to understand what word they are mentioning.” Abbi also added in the interview that if she heard some words she did not know in a conversation with her Chinese friend, she entered pinyin to get the characters.

In addition, two participants expressed in either interviews or journal responses that they used mobile devices to overcome comprehension barriers. They used mobile applications to aid the reading process and to help them read menus and street signs in China.

Practice. Sometimes participants used flashcard and game applications for practice. For example, in answering the question “How is your mobile device most helpful to you when you are studying Chinese? (Specifically, do you use your mobile devices more often to identify a Chinese character or to translate an English word into Chinese?)” (week 10), Gil wrote, “I use my iPhone mostly to translate an English word to Chinese, to find a simple phrase, or for flash cards to help memorize Chinese, as I am still learning characters.” In addition, in asking them about their plan to use game applications to practice writing characters, Chinese numbers, and pinyin, most of them confirmed that they plan to do so.

Theme Three: Despite Overall Positive Feelings, Participants Revealed Some Disadvantages and Problems

While maintaining an overall positive tone about using mobile devices to learn Chinese, participants nevertheless pointed out disadvantages and some worried about possible overreliance on mobile technology. In addition, journal responses reveal participants' limited knowledge of applications and lack of language proficiency.

Inadequacy and distraction. Participants pointed out the inadequacy and the distraction of mobile devices and applications. In answering the question "What are the disadvantages of using mobile technology to learn Chinese?" (week 12), five pointed out the inadequacy of mobile devices or applications and one mentioned the distraction of mobile technology. In terms of inadequacy, Martin wrote: "The only disadvantage I can think of is in the apps themselves. If grammar and examples of the use ... could be found in an app the disadvantages would be mitigated." Gil identified "running out of battery" as a problem. In regard to distraction, Gale wrote, "It's easy to get distracted when a text message, email, or a phone call pops up during your study session."

Overreliance on technology. Some participants pointed out potential problems of relying too much on mobile technology for learning Chinese. In answering the question "What are the disadvantages of using mobile technology to learn Chinese?" (week 12), four participants pointed out this kind of problem. Lisa stated, "It's possible that students could rely too heavily on things such as mobile dictionaries, and instead of learning the word, they merely look it up to find meaning for an assignment." Gwen wrote:

Computer translators tend to translate word-for-word and they don't always know the correct context for a certain word. It's easy to learn a word that's wrong from mobile technology and take it for granted that it's correct. Also, if you rely on mobile technology too much to translate, you may not actually learn why the sentence is translated the way it is.

Similarly, in answering the question “What are the total effects of using mobile devices for learning Chinese?” (week 13), two participants pointed out the limitation of technology. For example, Bell wrote, “The total effects are perhaps a dangerous benefit on language learning. Mobile technology is a great tool, but easy to become too dependent upon.” Similarly, in an interview, Lisa worried that students may simply look at characters without committing them to memory.

Lack of knowledge and limited proficiency. Some participants may not be aware of the existence of applications which might satisfy their needs. In answering the question “Looking to the future, are there any applications not available now that you think would be helpful? If so, please describe what they would do” (week 13), Martin wrote, “An app that could scan text by taking a picture of a character and then offering the meaning and pinyin would be very useful.” Yet, the application was already available. Applications such as CamDictionary and Pleco can scan characters and give their pinyin and meaning.

Participants’ limited knowledge of the language and low proficiency level may prevent them from using certain applications. For example, in finding the meaning and pronunciation of an unidentified character from a dictionary application, Lisa pointed out that students may not get the character if they are not able to write it in the correct stroke order. Another example is iFlyDictation which can turn dictated Chinese sentences into written form. Several participants read passages to iFly, but the application did not accurately transcribe oral words into written characters because of their imperfect pronunciation and/or intonation.

Theme Four: Collaboration and Teaching Facilitated the Knowing and Using of Mobile Applications.

Participant responses revealed that collaboration helped them to know about applications and how to use them. In addition, it is helpful when instructors teach about the availability and use of applications and incorporate mobile devices into the overall language learning curriculum.

Collaboration. Collaboration was reflected in knowing about the availability of certain devices either indirectly through looking at the reviews of applications posted by other people or directly through getting advice from friends and classmates. In answering the question “How do you typically find out about new applications? (From friends, searching the Internet, advertisements, online stores)” (week 16), with the possibility of giving more than one answer, ten reported searching in online stores and six mentioned learning about applications from other people. Specifically, among the ten who talked about searching in online stores, most of them read reviews by other people; for the students who got their applications from friends, they often learned not only of an application but also about how to use it at the same time.

Teaching about applications. Since individual participants did not know about the existence of many good applications, teaching about the availability of applications would no doubt be helpful to them. For example, none of the participants knew about HanZi Reader. When the researcher introduced this application to the participants, they were all excited about using the application for reading Chinese texts. For example, in answering the question “Do you plan to use it in the future? Why or why not?” (week 18), Jay answered, “Definitely, especially since this can cut and paste from other texts, while providing the English translations and pinyin. It is very handy.”

Since participants may not know how to use certain applications, it might be appropriate to teach them. For example, in answering the question about Hanzi Reader “Do you plan to use it in the future? Why or why not?” (week 18), Martin answered, “This was another very useful app. Reading through the idiom stories with the aid of instant translations was great. Adding text would be even better if you could import from outside the app.” It is possible to copy and paste an e-text into the application, yet the student did not know it.

Participants had different opinions on the effects of mobile devices for different proficiency levels. In answering the question “Students at which proficiency level could benefit most from using mobile devices, why?” (week 13), three participants mentioned that lower level students could gain the most advantage, five thought that

intermediate to advanced participants could get the most, while three thought that all students could benefit from using the devices. In sum, participants lacked overall vision on language learning at different stages, making it relevant and appropriate for instructors to incorporate the use of mobile devices into the language learning curriculum.

Discussion

Special Features of Mobile Devices for Learning Chinese

Mobile devices offer distinctive features for tutorial functions, mediating communication, and gaming. In terms of tutorial functions, mobile devices may provide more convenient access to vocabulary than computers. For example, one can scan a character and get its meaning and pronunciation. As to intelligent applications, mobile applications can transcribe speakers' spoken language into written characters. In terms of social computing, mobile devices can provide aid at any time and in any place. In regard to gaming, mobile devices provide engaging games to practice pinyin, Chinese numbers, and characters, because a user can easily interact with applications on the screen.

At the present stage, there are some aspects of mobile devices and applications which need to be improved. Dictionaries on mobile devices usually do not provide usages of words and the Internet connection is often slower than with computers.

Participants' Use of Mobile Devices

With varying frequency, participants used all three functions of mobile devices. Specifically, they used the tutorial functions heavily. They used dictionary and translation applications to get the meaning and pronunciation of unidentified characters and to get characters from English or pinyin. They also used flashcard applications to practice vocabulary, focusing on the written form, meaning, and pronunciation.

As to using mobile devices for social computing, some participants used dictionary and translation applications to facilitate face-to-face communication and to learn Chinese characters in the communication process. Participants used mobile devices differently

from using computers when doing social computing. This finding indicates that mobile devices could mediate face-to-face interaction and facilitate the connections among character written form, meaning, and pronunciation. This finding is new because most studies on mobile technology “in the areas of speaking and listening...focus on asynchronous speaking and listening activities” (Kukulska-Hulme & Shield, 2008, p. 281). This finding is important because as Warschauer (2005) points out, an important area of CALL research is to study “how medium shapes the linguistic interaction” (p. 47). The present research suggests that mobile devices shape the way students engage in communication and the way they learn characters.

In regard to gaming, participants generally had positive attitudes. Some of them have already played games to practice character writing, pinyin, and numbers; the rest plan to play with games in the future.

Discrepancy between Enthusiasm and Actual Use

Participants enthusiastically pointed out various advantages of using mobile devices to learn Chinese. The findings agree with Stockwell (2008) who found “over two-thirds of the learners expressed an interest in using mobile phones for language learning in either the short or long terms” (p. 269).

Participants, however, mainly used dictionary and translation applications and did not fully tap into the potentials of mobile devices. There might be several explanations for the lack of use of a wide range of applications. First, participants may not know all the good applications for learning Chinese because of their open and growing nature. Take Hanzi Reader, for example. None of the Apple device users knew about the availability of this free application. In addition, their proficiency levels may deter them from using some applications. Only two participants talked about watching Chinese TV or movies on their mobile devices. It might be because most of the participants had difficulty in understanding Chinese movies and TV. Another example is iFly. Although the students were excited to know about this application, many of them could not use it efficiently. Next, mobile applications may not be perfect. For example, some participants pointed out that dictionary applications often do not provide good examples of usage.

As to actual activities, participants mainly used mobile applications for quick reference to aid their coursework. Although some of them used mobile devices to facilitate face-to-face communication, not everyone had explored this aspect. Researchers have established that CMC is conducive to language learning. Similarly, mobile-mediated communication is also conducive to language learning.

Although participants frequently used mobile devices for quick reference, most of them did not regularly review the characters and words they looked up; only a few mentioned using flashcards to review the learned vocabulary. In sum, the discrepancy between appeal and use highlights the necessity of collaboration and scaffolding.

Social Learning is Crucial

Collaboration is important for learning to use mobile technology. In the present study, some participants clearly expressed that they knew about applications from their peers. Obviously collaboration facilitates the knowing of useful applications. Because it is time consuming to go through all the applications to find the needed one, learning from others provides a quick way to know about a good application. In addition, collaboration may provide help on the effective use of applications. Some participants expressed that they learned how to use a certain application from their peers. Furthermore, students may use an application unconventionally, yet effectively. For example, one participant said that she used a translation application to check if her translations in Chinese conveyed the same meaning as the original English sentences. It might be beneficial to let students share their experiences of using mobile applications.

Besides peer collaboration, it is important for instructors to provide scaffolding for students on the use of mobile devices so they may become savvy users of these technologies. First, because students may not know about the availability of good applications, instructors can suggest different applications to students at different proficiency levels. Second, students may not know how to use different language applications effectively, and instructors can provide scaffolding on the effective use of different applications.

With flashcard applications, for example, instructors may remind students to use the applications to practice the characters and words they looked up. Third, instructors may design different communicative tasks for students and ask them to use mobile devices to facilitate face-to-face communication.

As a product of this research, the two researchers created Table 1, which summarizes some useful free applications and their basic functions. It also addresses the question of how helpful these applications might be for students at different proficiency levels. The table might be useful for both instructors and learners.

Conclusion

Participants frequently used dictionary and translation applications for quick reference, used mobile devices to aid face-to-face communication, and showed interest in gaming. Although they were enthusiastic and often used mobile devices to learn Chinese, the frequently used applications and the variety of activities were limited. Collaboration and scaffolding are crucial for the effective use of mobile devices to learn Chinese.

When talking about computer technology, Kern and Warschauer (2000) point out, “these new technologies do not only serve the new teaching/learning paradigms, they also help shape the new paradigms” (p. 12). Similarly, the development of mobile technology may also cause changes in instructional practice. Instructors may need to pay special attention to character recognition for the following two reasons. First, the recognition of characters may become more important and relevant than the writing of characters. Besides using a finger to write characters, there are different ways to input characters: using keyboard and using voice input. Hence, the deficiencies in the knowledge of how to write a character may be compensated by technology. Second, unidentified characters can be quickly looked up in mobile devices, yet CFL learners still need to recognize characters and words in order to read texts proficiently.

Furthermore, the advance of mobile devices may make it more relevant for instructors to teach some specific skills. For example, learners need to transcribe sounds with pinyin in order to look up

words which they hear. They also need to know stroke orders to find out an unidentified character quickly from their mobile applications.

This research found an interesting phenomenon that CFL learners use mobile devices to mediate face-to-face communication. For future studies, it would be interesting to further explore this aspect.

The small number of participants limits this study in terms of conclusions that can be drawn. However, the present study yielded some interesting findings that can guide future research and support Chinese language instructors who seek to incorporate mobile technology into their curricula.

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Table 1. List of Free Applications

Application	Description	Proficiency Levels
KTdict C-E (iPhone)	<p>Dictionary</p> <p>KTdict C-E is very easy to use. One can input a character by hand to get its meaning in English, pinyin, and other words which embody the character; one can input pinyin to get characters; and one can input English to get Chinese corresponding words.</p>	All
Hanping (Android Phone only)	Dictionary	All
HanZi Reader (iPhone, iPod, iPad only)	<p>Provides pinyin and translations for words in the reading process.</p> <p>Hanzi Reader is a useful pop up Chinese dictionary. A user can copy and paste Chinese texts into the application.</p>	All
CamDictionary (iPhone and Android Phone only)	Scans written characters and translates	All
SlideShark (iPad only)	Shows PowerPoint presentations	All

Google Translate	Transcribes oral language into written language, and translates into another language; can also read out in another language	Beginning to Intermediate
iFly	Shows dictated Chinese words in written form	Advanced
Chinese Speak pad		Beginning
Chinese number Trainer by trainchinese (iPhone, iPod, iPad only)	Provides practice for learning Chinese numbers When playing the game, five numbers appear on the screen with one number read out. If the correct number is chosen, a green check will appear on the number and the box will turn green; if a wrong number is chosen, the red cross will be put on the number with the correct choice entry highlighted in green; and if no choice is made, the numbers will stay on the screen. A string attached to a firecracker keeps on burning, indicating the passing of time. At the end of the game, the firecrackers burned, and the gained scores appear.	Beginning to Intermediate
Pinyin Trainer by trainchinese	Provides practice for learning Pinyin	Beginning to Intermediate
trainchinese Chinese Writer (iPhone, iPod, iPad only)	Provides practice for writing characters At the beginning of the game, a character drops from the top. When the character is tapped on, the character is pronounced and enlarged for a player to write the character on	Beginning to Intermediate

	the screen with a finger. If the character is written with the correct stroke order, the player can get points; otherwise, the player cannot get any points.	
To Do Two Things at the Same Time- JoyOrange	Tells an idiomatic story in both Chinese and English	Intermediate to Advanced
唐诗三百首豪华版 [300 Tang Poems] (iPad only)	For a total of 300 poems, provides reading of each sentence, reading of each character, self recording, etc.	Advanced

Appendix

Questions

Journal One

1. What mobile devices (e.g., i-phone, android phone, etc.) do you use to learn Chinese? On your mobile devices, what applications (e.g., e-dictionary, etc.) do you use?
2. For what activities do you use mobile technology for learning Chinese?
3. How often do you use mobile devices to learn Chinese?

Journal Two

4. How is your mobile device most helpful to you when you are studying Chinese? Specifically, do you use your mobile devices more often to identify a Chinese character or to translate an English word into Chinese?
5. How do you look up an unknown character in the mobile devices?
6. What aspects of vocabulary knowledge (the way a character is written, radical, meaning, pronunciation, and frequently co-occurring character) do you pay special attention to after you find the unknown character and why?

Please rank the following in the order of importance for you after you identify the character.

- _____ The way a character is written
- _____ Meaning
- _____ Pronunciation
- _____ Frequently co-occurring character
- _____ Radical
- _____ Other (please specify)

7. What is the likelihood that you will recognize the character when you encounter it at a later date?

Journal Three

8. When you use mobile devices to translate English words into Chinese, what are your criteria for picking a Chinese word if there is more than one choice?
9. Which aspects of vocabulary knowledge (the way a character is written, radical, meaning, pronunciation, and frequently co-occurring character) do you pay special attention to after you obtain a Chinese

character? Why?

Please rank the following in the order of importance for you after you obtain the character.

- _____ The way a character is written
- _____ Meaning
- _____ Pronunciation
- _____ Frequently co-occurring character
- _____ Radical
- _____ Other (please specify)

10. What is the likelihood that you will recognize a character you looked up when you encounter it at a later date? What is the likelihood that you will use the Chinese word on your own?
11. Which mobile devices do you see as being most useful to students at various proficiency levels? Why?

Journal Four

12. Generally speaking, how do you feel about using mobile technology to help you study Chinese?
13. What are the advantages of using mobile technology to learn Chinese?
14. What are the disadvantages of using mobile technology to learn Chinese?
15. Have you explored any unconventional uses of mobile devices and applications in studying Chinese? If so, please describe these experiences.

Journal Five

16. Looking to the future, are there any applications not available now that you think would be helpful? If so, please describe what they would do.
17. Describe the ways you use mobile devices to learn Chinese by interacting with people?
18. What are the total effects of using mobile devices for learning Chinese?
19. Students at which proficiency level could benefit most from using mobile devices, why?
20. How do you typically find out about new applications? (From friends, searching the Internet, advertisements, apple store.)

Interview Questions

21. How do you typically find out about the usage of new applications?
(From friends, searching the Internet, advertisements, apple store.)
22. Do you mainly use mobile devices to help you with course work?
What else do you do concerning learning Chinese?

Journal Six

23. For the 11 applications, the following two questions are asked:
Did you know about this application before?
Do you plan to use it in the future? Why or why not?