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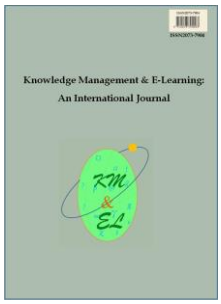

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Investigation of a Chinese character writing app: Learners' perspectives

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Abstract: Many people who learn Chinese as a foreign language (CFL) have encountered challenges when it comes to character writing. This was a follow-up study of our quantitative study in 2019 that showed that mobile app was a significantly more effective method than pen-and-paper method to learn Chinese character writing. Thirty beginning CFL learners participated in this study. Surveys and interviews were conducted to seek their perspectives on the role of stroke order knowledge, the use of the mobile app in Chinese writing, and suggested ways to teach Chinese character writing. As shown in the results, findings demonstrated that the participants recognized the value of the app in their character learning. They held the view that stroke order not only plays an important role in Chinese writing, but also should be emphasized at the beginning level. Although the use of the app was favored, compared with the conventional pen-paper method, a mixed method of both was suggested for pedagogical practices.

Keywords: Mobile assisted language learning (MALL); Mobile app; Chinese language learners; Chinese character writing; Stroke order knowledge

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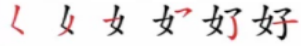
1. Introduction

Chinese character stroke order is important when it comes to the instruction of writing Chinese as a foreign language (CFL) to beginning learners. The main reason is because, unlike English that uses alphabets, Chinese uses a different system -- logograms or characters. Different characters comprise various radicals and components, which are made up of strokes, the most fundamental writing unit in Chinese. As Table 1 shows below, 好 is a Chinese character, meaning "good" in English. It is made up of two parts: the left part is a radical "女", indicating a woman, and the right part is a component that means "a kid". These two parts can further be broken down into six strokes. To learn to write the character, students must know where and how to start the first stroke, followed by the second stroke and so on, as shown in the third column of the table below.

Table 1
An example of Chinese character composition and writing

Chinese character	Radical & component	Stroke-by-stroke writing	English
好	女 + 子		Good

There are six basic strokes in written Chinese, each with several different variants. As with writing English alphabets, there are certain rules to where and how to write strokes to form the shape of a Chinese character. Seven general rules were established, including writing from top to bottom, from left to right, and horizontal first and vertical second. The purposes of setting up such rules, according to Zhou (2007), are to standardize the frequently used Chinese characters, to avoid errors in writing Chinese, and to simplify and speed up the writing process. Knowing the rules means having the stroke order knowledge. With the knowledge, learners can write Chinese characters correctly and fluently. They can also produce the most aesthetical and balanced characters with the least amount of hand movement. On top of that, stroke order knowledge helps learners better remember the shapes of characters, which is why it is taught in Chinese schools from a young age. Researchers (Chen & Kao, 2002; Lo, Yeung, Ho, Chan, & Chung, 2015) have found that stroke order knowledge is an important indicator for Chinese character writing performance.

However, writing Chinese characters has always been a challenging task for CFL learners due to several main reasons. First, Chinese is a pictorial language, where the sound is not associated with how a character is written. The inconsistency of sound-shape association makes writing Chinese clueless, meaning each character must be learned and practiced individually. The practice of writing, therefore, requires repetition and memorization, which is a demanding and even intimidating task for CFL learners (Everson, 1998; Ke, Wen, & Kotenbeutel, 2001). Second, the Chinese writing system contains many different elements including basic strokes, stroke order rules, various radicals, components, and characters. It is a whole new skill for CFL learners to develop, where they must learn how to put in order specific sets of strokes, as well as how to structure various radicals and components to form different characters (Shen & Ke, 2007). The complex writing process adds to CFL learners' learning load (Nation, 2001; Shen, 2004). This is especially true for those whose native languages are distant from Chinese. According to DeFrancis (1984), it takes the average CFL learner several months of hard work to get the basics of Chinese character writing down, and it takes twice as long to learn to write the high-frequency Chinese characters as to learn to write alphabetical languages to achieve comparable levels.

Furthermore, teaching how to write Chinese characters stroke by stroke is also challenging for CFL instructors. Given the complicated nature of Chinese written system, it takes too much of class time to teach everything to students. To save time, instructors normally briefly explain the stroke order rules, demonstrate several examples, and then provide character practice sheets for students to practice writing Chinese on their own after they learn each lesson. This conventional method requires mechanical repetition and rote memorization, which has proved to be time-consuming and inefficient (Packard, Chen, Li, Wu, Gaffney, Li, & Anderson, 2006). In addition, it does not enable instructors to assess whether students follow the stroke order rules or not and how correctly they do the work.

To overcome the challenge, there is a pressing need to provide instructional support that is time-saving and effective. In recent decades, with the rapid increase of affordable technologies, many computer-assisted and mobile-assisted language learning tools have been used at American colleges to help Chinese language learners to practice and master character learning, including web-based handwriting practice, multimedia mediated tasks for character recognition, and stroke order animation software (Jin, 2018; Rosell-Aguilar & Qian, 2015). Studies (Kuo, Huang, Liao, & Huang, 2011; Lu, Meng, & Tam, 2014; Sung, 2014; Tang, Li, & Leung, 2006) have shown that these are useful tools that facilitate students' character learning and reduce their frustration through enjoyable and engaging interactions. As the use of mobile-assisted pedagogical tools has attracted much attention in the research community recently, a natural question is: How do mobile apps perform for Chinese character writing?

Fig. 1. Train mode, drill mode, test mode (from left to right)

2. The Xiezi mobile application

The Xiezi app is specifically designed for Chinese character writing, developed, and customized for our curriculum by Clavis Sinica (https://www.clavisinica.com/mobile-xiezi.html). It features three modes: train, drill, and test (see Fig. 1). In the train mode, students can view stroke-by-stroke animation of each character and then practice writing it using the character box provided. The app checks every stroke that students write, helping them recognize and correct the mistakes as they go along. Different from the still image stroke-by-stroke demonstrations of Chinese characters on paper, the animations in this app smoothly retrace the order of each character, so students can easily see how a character is written stroke by stroke and practice writing by following the animated

example. In the drill mode, students are prompted to write each character stroke-by-stroke from memory. If they get a stroke wrong, the app will show the correct version and then return the character to the vocabulary stack and the missed characters folder so that the students can try it again later. In the test mode, students have only one chance to write each character from memory, and the score would be recorded for accuracy and progress checking.

For this study, the Xiezi app was mainly used by the participants to view the stroke order demonstration after class, independently practice writing each stroke with their fingers on the cell phone screen in the drill mode as many times as they like before they decided to do the test.

3. Literature review

Since 2008 with the advent of the first mobile app at iPhone store, educators have seen its potential for foreign language learning. The most obvious advantages are its easy accessibility and low cost. It is accessible to anybody who can afford a cell phone, tablet, or computer, where they are free to learn a foreign language at any time they like or wherever they want at their own pace. Learners do not have to rely on teachers in schools. As Stockwell (2010) pointed out, "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). Additionally, the price for the mobile apps is much lower than for any real language courses online or in a language school.

Personalization is another key feature that makes mobile apps favored by language learners. Most language learning apps provide various tasks that target at developing different language skills – some are designed to assist vocabulary memorization; some aim at grammar explanation; others feature listening, reading, speaking, or writing skill development. They can meet different learners' various learning needs. In a study that examined a context-based support system of mobile Chinese learning for foreigners, Sun, Hou, Hu, and Al-Mekhlafi (2015) found that the personalized e-learning system can support the mobile Chinese learning process. The system achieved this by providing learners with customized learning materials according to the contexts of the tasks learners did as well as their profiles and mobile devices. This greatly improved the effect and efficiency of the target language learning.

Besides the advantages mentioned above, ubiquity, interactivity, collaboration, and immediacy are also important characteristics that make mobile learning favored by foreign language instructors and learners (Ozdamli & Cavus, 2011). As mobile learning can create an engaging and interactive environment where learner-centered cooperative learning and seamless learning are encouraged and instant feedback is provided, higher learning outcomes thus can be expected (Liu & Olmanson, 2016; Pisarenko, 2017; Tang, Li & Leung, 2006). This is supported by Sun's (2011) self-reflections upon the online language instruction. When online activities were designed centering around students' learning needs and interests by utilizing a variety of communication tools, students became active learners.

Given the huge potential, many studies have been conducted on the use of mobile apps in foreign language learning and teaching in the past decade (e.g., Li & Zhou, 2019; Burston, 2014; Ma, 2017), which have found positive findings. For instance, Abduliah and Tajuddin (2017) reported that the students tended to have a generally favorable attitude towards the usability, effectiveness, and satisfaction of smartphones and language learning apps. Pisarenko (2017) also found that language learning apps feature

multimedia and interactivity that contains images, sound, and video, which makes language learning more entertaining, motivating, and effective.

Besides the motivational effect, research has also reported positive learning results of using mobile apps to assist foreign language learning. Klimova's (2019) analysis of students' needs found that smartphone apps enhanced university students' foreign language performance, particularly studying and revising English vocabulary and phrases. Similarly, Zou and Li (2015) investigated how mobile apps could be integrated into college ESL teaching and found that the app which provided sources related to lessons offered extra support to students to practice English in and after class. The review of 15 English learning apps by Wang et al. (2021) also showed favorable results in that they help students master vocabularies by providing translation into their native languages, images, audios, and sometimes games. To sum up, using different apps in foreign language learning has successfully enabled learners to practice their language and get feedback instantaneously.

Mobile assisted studies on CFL teaching and learning have emerged in recent years and have also identified some positive findings. For example, Chee, Yahaya, and Ibrahim (2017) conducted a quasi-experimental study to investigate the effects of smartphone application on Chinese language reading skills by comparing it with the traditional method. Findings indicated that students preferred the former method because it could leverage motivation and interest. In a similar study that investigated the use of the Chinese dictionary mobile app Pleco in extensive reading classes, He and Yang (2016) interviewed 11 university students who took advanced Chinese courses and found that Pleco fascinated students' memorization, pronunciation, and comprehension of new vocabulary. In the same line, Al-Mekhlafi, Hu and Zheng (2009) investigated the effect of Context-Aware Mobile Chinese Language Learning (CAMCLL), a service guide that students could use to practice their real-world Mandarin on their mobile phones when they were out of school. It was discovered that this approach enhanced the Chinese language learning efficiency and effects for CFL learners. Tian et al. (2010) evaluated two mobile learning games played in China and found that they were helpful in the players' Chinese literacy acquisition process since it involved group learning activities such as controversy, judgments, and self-correction during the game play, which maximized literacy learning in context. Adopting a between-group design and a quantitative method, Li and Zhou (2019) compared two groups of American college students' learning of Chinese character writing via an APP game versus pen-and-paper method. 144 students participated in the study with 48 in the control group using the character worksheet pen-and-paper method and 96 in the experimental group using the APP game. They were instructed to write out the stroke orders of 60 characters chosen from their textbooks balanced in stroke density and character structure over the course of two semesters in ten tests. The results showed that the experimental group outperformed the control group significantly in terms of the stroke order recall accuracy regardless of the character stroke density.

4. Research questions

The above review has indicated that mobile learning has become a trend in foreign language education; however, research on mobile Chinese language learning is just a recent phenomenon. Therefore, very few studies except Li and Zhou (2019) have been conducted on using mobile applications to support Chinese character teaching and learning. This study is designed to follow up Li and Zhou (2019) to address the gap in the

literature of student perceptions of the use of a Chinese character writing app. The research questions include:

1. How do beginning CFL learners perceive the role of stroke order knowledge in Chinese character writing?
2. How do the learners perceive the use of the Xiezi app?
3. What is their preferred way of learning to write Chinese characters?
4. What are the pedagogical implications?

5. Method

5.1. Setting

The participants were the students who took one year of beginning level Chinese courses (CHS101 and CHS102, two consecutive Chinese language courses for beginning learners with CHS101 preceding CHS102) at an American university. The data were collected at the end of the academic year. Writing Chinese characters was part of the curriculum. In the first two weeks, stroke order rules were briefly introduced in class and frequent character writing demonstrations were made by the instructor. After that, the students were required to practice writing Chinese characters after class, using the Xiezi app on their mobile phones. The app enabled them to view the stroke-by-stroke demonstration of each character, practice individual writing and assess their progress. They got instant feedback regarding how they were doing on each character writing. As part of the graded assignment, they were asked to submit their writing work after they learned each dialogue (every lesson has two dialogues). As the app had built-in test functionality to evaluate students' writing performance, the instructor only checked their completion.

Given that the app had some issues with Android users during the time when the app was used by the learners, several students were provided with character sheets, and they used the conventional pen-paper method to practice Chinese writing.

5.2. Instrument and data collection

Data were collected from an online survey designed by the first author, which was designed to ask the participants questions about their perceptions of the integration of the Xiezi app into their CFL learning. It contained four parts. The first section had three questions, briefly asking about the participants' background, including gender, age, and years of using the app. The second part had one Likert scale question (ranging from 1 representing "strongly agree" to 5 meaning "strongly disagree"), designed to examine their belief in the role of stroke order knowledge and Chinese character writing. The third section comprised eleven 1–3-point Likert scale questions, investigating their learning experience when using the app. The fourth part had three open-ended questions, asking them how much time they spent on the app, which approach they preferred and why, and what suggestions they had for future use.

5.3. Participants and data analysis

All the 43 students who took the one year of beginning Chinese courses were invited to participate in the online survey. Thirty participants agreed to do it, among whom 24 used

the Xiezi app (80% of the total) and six used the pen-paper method (20%). The participants' average age was 19. There were 18 males and 12 females. Twenty-six of them were freshmen, and the rest were sophomores. They had never used the Xiezi app before they took the two beginning Chinese courses.

Both quantitative and qualitative analysis were applied, as the survey contained both data. Quantitative analysis was conducted by entering the 30 valid surveys into the SPSS (Statistical Program for Social Sciences) 12.0.1 database, and then responses were analyzed using descriptive statistics. Qualitative data were first categorized by topics; and then frequency analysis approach was applied by counting the occurrences and calculating the percentile values. The above analysis sought to identify commonalities within the process of using the app to practice writing Chinese.

6. Findings

6.1. Learners' perception of stroke order knowledge

The analysis revealed that the CFL learners placed very high importance on the role of stroke order knowledge in Chinese character writing. Fig. 2 below shows that about 77% of the participants agreed that it was important to emphasize the stroke order when starting to learn to write Chinese characters. With regards to the question of when it should be emphasized, 66.7% expressed that it should be stressed when they took the beginning level Chinese courses, including CHS101 and CHS102; 30% wanted it to be emphasized at all levels (see Fig. 3).

The qualitative analysis also revealed that the above finding was consistent with their practice with Chinese character writing. 63.4% of the participants reported that they spent more than 30 minutes every day practicing writing the Chinese characters for each lesson; 33.3% said that they spent 10-20 minutes doing that; and 3% spent less than 10 minutes.

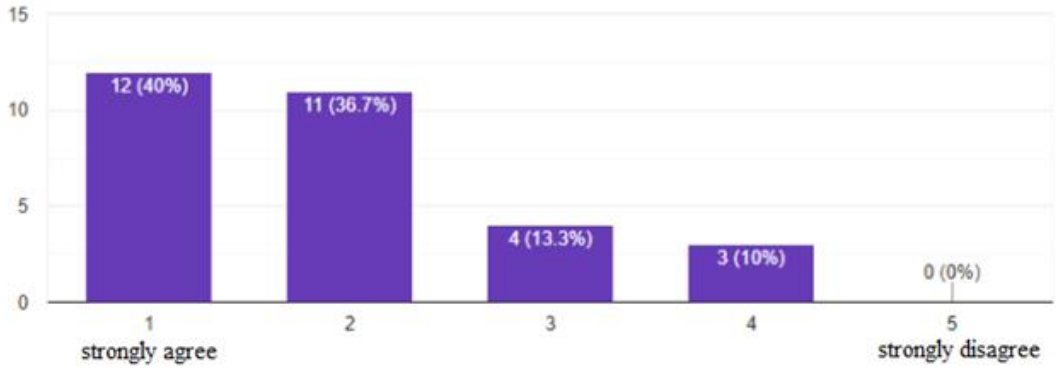


Fig. 2. Belief in the importance of stroke order

6.2. Learners' perceptions of the Xiezi app

The three modules (train, drill, and test) of the Xiezi app were evaluated by the participants. The purpose was to assess the ability of the app to (1) satisfy learners' learning needs; and (2) assist them in learning Chinese characters.

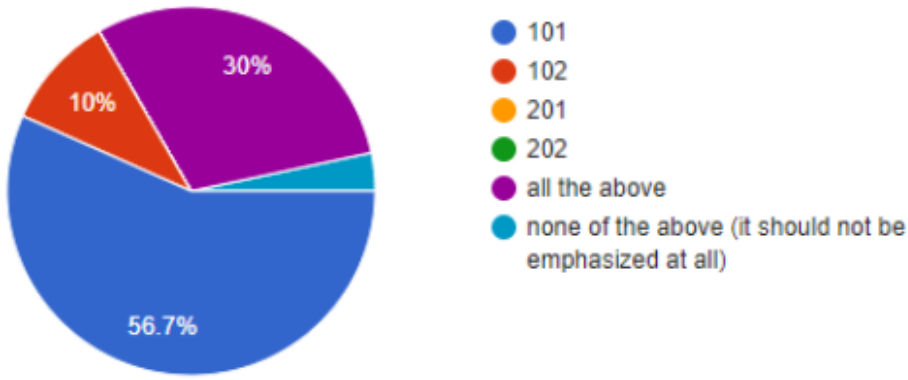


Fig. 3. When to emphasize stroke order

Note. 101, 102, 201, and 202 are course numbers offered consecutively in two academic years. CHS101 and 102 are designed for Chinese beginning learners, with 101 before 102. CHS201 and 202 are designed for intermediate learners, with 201 preceding 202.

As shown in Table 2, most of the participants (66.7%) perceived that it was easy to use the app and the design of the "train", "drill", and "test" modes was great in assisting them in learning the basic aspects of Chinese writing such as stroke order and individual character writing. Specifically, 66.6-66.7% of the participants were satisfied with the interface of the "train" mode, and 60-70% agreed that it helped to enhance their knowledge of stroke orders by viewing the animation of each. 73.4-76.7% of the participants agreed that the "drill" mode helped them with memorizing Chinese characters as well as recalling them. About 73.4% of the participants agreed that the "test" mode helped them reinforce the correct stroke order of Chinese characters.

Table 2
Perception of the modes of the Xiezi app

	Agree	Neutral	Disagree
I find it easy to navigate through the Xiezi app.	66.6%	16.7%	16.7%
The "train" mode on the Xiezi app showed use stroke order clearly.	66.7%	13.3%	20%
I was able to learn the stroke order very well from viewing what the "train" mode showed me.	60%	13.3%	26.7%
The "train" mode on the Xiezi app helped me increase my knowledge of stroke order.	70%	16.7%	13.3%
Practicing writing stroke order through the "drill" mode on Xiezi app helped me remember the correct stroke order.	73.4%	13.3%	13.3%
After viewing the stroke order shown on the "train" mode, practicing writing through "drill" on Xiezi app helped me recall the number of strokes easily.	76.7%	13.3%	10%
The "test" mode on Xiezi app helped me reinforce the correct stroke order of Chinese characters.	73.4%	13.3%	13.3%

How did the CFL learners in this study perceive the effectiveness of the use of the Xiezi app in Chinese character writing? Their responses (Table 3) showed that about 73.4% of the participants indicated that the app helped to increase their confidence in Chinese writing; 70% agreed that it assisted them in speeding up their Chinese character writing; and 63.4% believed that it was helpful in translating writing Chinese on screen to writing on paper with pen. More than half of the participants (56.7%) expressed that they applied the stroke order rules to writing practice.

Table 3
Perception of the effectiveness of the app

	Agree	Neutral	Disagree
Practicing writing the characters on screen helped me learn to write them on paper as well.	63.4%	23.3%	13.3%
The learning of stroke order on Xiezi app has assisted me to speed up my writing of the Chinese characters.	70%	23.4%	6.6%
I always follow the stroke order in writing Chinese scripts on paper.	56.7%	23.3%	20%
I felt more confident in writing Chinese characters due to the practice of the stroke order on Xiezi app.	73.4%	13.3%	13.3%

6.3. Learners' preferred method of learning to write Chinese

When asked which way they preferred to use, the Xiezi app or the paper-pen method, it is interesting to note that there were disagreements among the participants. Among the 80% Xiezi app users, 60% of them expressed that they preferred using the app because it was convenient, efficient, easy to navigate, and it provided instant feedback and helped reinforce memorization of the learnt characters. Among the rest 20% Xiezi app users, 10% stated that they preferred a mixed method, that is, using the app to learn the stroke order knowledge and then practice writing on paper. The other 10% users did not like the app because it was too repetitive, too specific on strokes, and slow in responding. Sometimes the app froze, and they had to restart the whole learning process, which made them annoyed. In addition, it cost money. Therefore, they wanted to switch to the paper-pen method instead.

However, the 20% Android users who had no access to the app said that they liked the pen-paper method more because it helped to train their fine motor skills, and they felt it easier to remember Chinese characters when writing on paper using pens. In addition, the paper-pen method cost no money.

7. Discussion

The study found that the CFL learners believed that stroke order knowledge played an important role in Chinese character writing, and it should be emphasized at the beginning level. Stroke order knowledge was not only necessary, but essential for effective Chinese writing, which was best learned through repetitive but engaging practice. Moreover, it helps them to learn to hand write Chinese characters in a faster and easier way. This finding is consistent with the study conducted by Ling and Jaganathan (2014) on CFL

learners' knowledge and perception of stroke order. The data were obtained via questionnaire, teaching intervention and interviews from 73 participants who were taking four levels of minor and option courses. The results showed that the overall respondents had a good knowledge of the Chinese language stroke order and perceived it useful in producing accurate Chinese writing, hastening the writing tasks, and providing the accurate spelling of words. Findings from this study recommend that the teaching of stroke order needs to be implemented at the elementary level for more accurate and effective teaching, learning and retention of writing in a CFL course.

Similar to other studies on mobile assisted Chinese language learning (Li & Zhou, 2019; Liu & Olmanson, 2016; Lu, Meng, & Tam, 2014), the results of this study also indicate that learning Chinese character writing via mobile apps is effective in the enhancement of beginning CFL learners' stroke order knowledge and individual character writing performance. Li and Zhou (2019) conducted an experimental study by comparing two methods of teaching Chinese character stroke orders, an app game versus traditional pen-paper method. Their research showed that the former was significantly more effective than the latter. To understand how users evaluated the integration of a mobile application into Chinese character learning, Rosell-Aguilar and Qian (2015) collected quantitative data from over 130 users as well as qualitative data from interviews with four users. They discovered that the users had very positive attitudes. This finding also corroborates previous studies regarding the favorable effects of computer-assisted tools for language learning (Tang & Leung, 2006; Tang et al., 2006; Tsai, 2014; Tsai, Kuo, Horng, & Chen., 2012).

When asked what suggestions they would give for future use, 60% of the participants insisted that the app should be used because the stroke-by-stroke animated demonstration of each character was helpful in learning the stroke order rules and memorizing the strokes and shapes of characters. This finding is in alignment with Wang's (2005) study on a conceptual model for multimedia presentation of picture-related Chinese characters. The mixed method analysis found that multimedia contributes to the presentation of a picture-related Chinese character and facilitates learners' structural understanding of Chinese characters and improve recognition and writing. It is also supported by findings of previous research on the role of mobile apps (Abduliah & Tajuddin, 2017; Pisarenko, 2017; Rosell-Aguilar & Qian, 2015) that multimedia devices, including mobile apps, are more favored by foreign language learners due to their integration of audio, video, interactive and animated features. Multimodality and interactivity help enhance students' understanding of conceptual knowledge, facilitate the learning process, and increase their interest to learn (Churchill, 2008).

Another reason why the app was favored, according to the participants, is because the built-in assessment functionality provided instant feedback regarding how they performed in the character writing process, which helped deepen their understanding of stroke order rules and ensure that they didn't reinforce incorrect writing practice or habits. This is supported by previous research (e.g., Hattie & Timperley, 2007) that instant feedback greatly influences students' language learning and achievement. It is particularly effective when it provides specific information about how learners are doing and what the correct way is.

Despite that some studies (e.g., Packard, Chen, Li, Wu, Gaffney, Li, & Anderson, 2006) have found that traditional paper-pen method was disadvantageous, compared with mobile apps, this study discovered that the non-Xiezi-app users chose to stick to the traditional writing method. This seems to suggest that both methods should be offered for students to choose from. The reason is simple: they complement each other by fascinating

Chinese writing in different ways. The Xiezi app provides a perfect platform where CFL learners get the optimal input of stroke order knowledge and focus on stroke-by-stroke drills, while the pen-paper method offers an opportunity for them to translate such a writing into the real-world practice. This finding corroborates with a recent study that compared the effectiveness of developing CFL learner's orthographic knowledge of reading and writing Chinese characters in different conditions, reading, reading with stroke sequence animation, and reading with writing the characters based on their pinyin and English translations (Xu, Chang, Zhang, & Perfetti, 2013). The post-test and delayed post-test results on 36 CFL learners showed that the combination of writing and stroke sequence animation conditions led to better form recognition.

In addition, the combined method (app plus handwriting) is very likely to reduce the time it takes to master the stroke order knowledge, compared with the mere conventional approach. For CFL learners, mobile apps may not only increase efficiency in learning, but may also provide more opportunities for engagement with the target language.

8. Pedagogical implications

Based on the findings of this study, we would like to make three pedagogical suggestions. First, whenever CFL learners start to learn writing Chinese characters, stroke order knowledge needs to be introduced and emphasized. In North America, some university teachers do not devote much class time to the explicit introduction of stroke order rules because they are more concerned with finishing the planned curriculum within the limited timeframe, which would result in students' incomplete comprehension about Chinese character writing, incorrect writing practice, and bad writing habits. To avoid such a problem, our suggestion is that stroke order knowledge should be emphasized when Chinese writing is introduced. This can be done in two ways. On the one hand, instructors systematically explain stroke order knowledge and how it is related to Chinese character writing. On the other hand, mobile apps that are designed to teach and reinforce such knowledge and skills can be introduced for after-class use. This will help save class time for communicative activities.

Second, while a mobile-assisted Chinese character writing tool, such as Xiezi app, is integrated into CFL curriculum, the option of using traditional pen-paper method should also be encouraged. This mixed pedagogical practice is proposed because it allows the two methods to complement each other. Specifically, on the one hand, research findings support positive effects of using multimedia tools to learn to write Chinese characters. On the other hand, providing various learning tools may give students more choices and cater to their different learning styles and needs, which will lead to more actively engaged learners and allow for effective learning to occur.

Third, providing immediate feedback on students' character writing performance is very important because it helps to keep them on the right track. When choosing a mobile app to use, it is necessary for instructors to consider whether it has the affordance of built-in test function. If they decide to go with the pen-paper method, they need to create an effective system that enables them to provide timely assessment and instant feedback to students regarding how they are doing and where corrections are needed. Assessment instruments such as pop quizzes, blackboard character writing demonstrations, or regular stroke order quizzes will help to meet this need. Having students write on Chinese character practice sheets without checking their performance is

ineffective because instructors do not know if learners follow the correct stroke orders and learners are unclear about their progress, which might result in error fossilization.

9. Conclusion and limitations

The purpose of this study is to examine the use of a Chinese writing app among beginning CFL learners. The survey results have found that the participants held positive attitudes towards the role of Chinese character writing. They believed that stroke order should be emphasized at the beginning level.

In addition, the participants generally had satisfactory experience using the Xiezi app. They used it mostly as a tool to view the animated demonstration of how each character is written, practice writing stroke by stroke, and get evaluations on how they performed. They also valued the effectiveness of the app in helping them follow the stroke order rules. The best features of the app were the animated train program and error analysis drill mode, which granted learners both reading and writing practice, while enhancing the acquisition of stroke order knowledge, including character shape and stroke order rules. Therefore, findings of this study encourage the use of such mobile-assisted learning apps within and beyond the classroom.

Given that the app has both advantages and disadvantages in terms of usability and technology functionality, and students have different learning needs when they practice writing Chinese characters, it is necessary that different options be provided to students to optimize their learning. In addition, the app needs to be improved in terms of affordance and technology functionality.

This survey study does add to our current limited knowledge of the integration of technology tools into Chinese language learning from the perspectives of the CFL learners. However, it should be noted that this study has several methodological limitations. First, this study employed a convenience sampling technique, and the sample size was small; therefore, the results cannot be readily generalized to other populations and further studies are needed to examine more on this topic. Second, the study relied only on the survey data. More qualitative data such as follow-up interviews would have triangulated the survey data and strengthened the design of the study. Third, the survey used a three-point Likert scale, which lost some information about the intensity of the participants' opinion. In the future, scales with bigger numbers of response categories should be used to increase the instrument reliability and validity.

Author Statement

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