Learning Strategies for Chinese Character Handwriting BY CSL Students in International Schools

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Abstract

This study investigated learning strategies for Chinese character handwriting (CCW) among students of Chinese as a second language (CSL) in Hong Kong international schools. It first developed an inventory for identifying CCW strategies. The data obtained from the international school students showed that the most frequently used learning strategies as those related to the meaning, structure and shape of Chinese characters; the least frequently used strategies were found to be games, calligraphy, and metacognitive strategies. Then, a factor analysis revealed that two dimensions exist for CCW strategies: knowledge-based and indirect, indicating that both linguistic features of Chinese characters and the cognitive process of handwriting influence students' employment of CCW strategies. Accordingly, suggestions for teaching approaches and improvement were provided.

Keywords: Chinese character handwriting, Learning strategy, CSL learners, International school

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1.INTRODUCTION

Chinese character handwriting (CCW) has long been considered one of the major challenges for learners of Chinese as a second language (CSL) (Everson, 1998; Ke, 1996; McGinnis, 1999; Yin, 2003; Yang, 2018; etc.). As such, some CSL students and instructors have suggested using computer-assisted writing systems to lessen the burden of CCW (Ye, 2013). Some stated that learning CCW is a waste of time (Allen, 2008). However, CCW not only promotes the memorization of orthography and of the meaning of Chinese character (Guan et al., 2011; Cao et al., 2013; Hsiung et al., 2017), but also improves the development of character recognition in learners (Chan et al., 2006; Guan et al., 2011; Tan et al., 2005). In a word, the importance of CCW should not be overlooked for CSL learning and teaching.

Language learning strategies (LLS) strongly affect learning performance (Dreyer & Oxford, 1996; O'Malley & Chamot, 1990; Oxford, 1990 & 2011; Shen, 2003; etc.) and have been adopted as "an extremely powerful learning tool" for increasing learner autonomy in L2 teaching (O'Malley et al., 1985, p.43). As characters are the basic units for Chinese literacy, CCW is a first hurdle CSL learners must overcome. CCW corresponds to the transforming of Chinese orthographic knowledge into a motor activity of the hand. This decoding process requires specific learning activities. Understanding CCW learning strategies provide direct insights into how students develop the CCW component of literacy acquisition. Once we understand how CCW is learned and identify CCW strategies, those strategies could be available for CSL learners to assist them in CCW learning. However, CCW has always been mixed up with character recognition under the more general term of "Chinese character learning" in previous research on learning strategies (McGinnis, 1999; Everson, 1998; Ke, 1998; Tseng, 2000; Jiang & Zhao, 2001; Shen, 2005). It is rare to see quantitative research that addresses CCW strategies specifically, and none of the previous studies develop a valid and reliable instrument to qualify CCW strategies. It is necessary to develop one to quantify

CCW strategies specifically. The presented study is a pilot endeavor to respond to this call.

International school students in Hong Kong are selected as the subjects for this study. As CSL learners, they usually perform well in speaking or reading but have poor writing proficiency in Chinese. Using them as the subjects of investigation can thus lower the limitation from meaning and pronunciation of character learning and allow us to focus more on CCW. As these students' learning approaches to CCW will be diagnosed through the instrument developed in this study, i.e., the *Chinese Character Writing Strategies Inventory* (CCWSI), findings of this study will provide advice and instruction on how to overcome CCW learning difficulties in the international school environment.

Following this introduction, section 2 will review the previous studies of CCW and introduce the international school setting in Hong Kong; section 3 will introduce the methodology of CCWSI development; and section 4 will present the underlying structure of CCWSI and the employment of CCW strategies by CSL students in an international school in Hong Kong. A discussion of the impact of the international school setting on CCW learning and the conclusions of this paper will be provided at the end.

2.STUDIES OF LEARNING CCW AND INTERNATIONAL SCHOOLS IN HK

2.1 Features of CCW

Different from one-dimensional writing systems in which scripts or letters are arranged on a line, such as alphabetic languages (Shu, 2003; Shen, 2004; Yang, 2018), Chinese characters, the so-called "Fangkuaizi" (方塊字), are composed by unique patterns of strokes and sub-character components that must be contained in a box or an imagined square (Hoosain, 1992; Tan et al., 2005; Hsiao & Shillcock, 2006; Lam et al., 2011). Meanwhile, as a logographic system, the Chinese script

encodes many homophonic syllables. There are about 7,000 morphemes in Chinese but only 1,200 syllables (Shu, 2003). On average, more than 5 characters or morphemes share one syllable. Some syllables can be shared by more than 10 characters. For example, there are 49 Chinese characters vocalized as /ji/ (He, 2000). Thus, phonological information is not sufficient to access the semantic meaning of Chinese characters (Tan et al, 2005; Yang, 2018).

The learning of Chinese characters consists of character reading and character writing. Character reading usually requires learners to know the meaning and pronunciation of the target character, and character writing involves producing the character based on its meaning and pronunciation (Hayes, 1998 Sergent & Everson, 1992; Ke, 1996). Character reading and character writing are correlated (Ke, 1996), but they each involve different cognitive abilities (Packard et al., 2006). To assess learners' performance in character writing, researchers usually obtain data from free writing assignments or spontaneous writing (Jiang & Liu, 2004; Su, Zhang & Guan, 2007; Yi, 2010;), copying tasks (Tan et al., 2005; Lam et al., 2011; McBride-Chang, Chung & Tong, 2011; etc.), and writing-to-dictation tasks (Ho et al., 2007; Cheng-Lai et al., 2013; Liang, 2019; etc.).

Tan et al. (2005) did two experiments to examine CCW and how character writing mediates reading development. A total of 131 children from a Beijing primary school were tested. They reported that CCW promoted reading performance because CCW develops orthographic awareness and forms long-term motor memories of Chinese characters, especially among learners at the beginning and intermediate levels. Chan et al. (2006) conducted a comparative study of dyslexic children in HK and found a similarly substantial correlation between reading and writing, i.e., CCW promotes reading proficiency. CSL learners also demonstrated similar characteristics to native speakers in acquiring characters. Guan et al. (2011) used adult CSL learners who enrolled in Chinese classes in Carnegie Mellon University as subjects to investigate the supportive role of CCW in Chinese reading. They reported that CCW affects orthographic

recognition as well as orthography-semantics and orthography-phonology links, which indicates that CCW strengthens visual-spatial information and enhances neuromotor memories. Ke (1996, 1998) investigated the relationship between Chinese character reading and writing in CSL learners from US colleges. He stated that CCW is more difficult than character reading for CSL learners. Some graphic details of a character may match existing characters in memory, but complete knowledge of the target character is required for writing, so that learners who are good at character reading are not necessarily good at character writing, but those who are good at character writing are also good at character reading (Ke, 1996, 1998). Cao et al. (2013) did a functional magnetic resonance imaging (fMRI) study to examine the writing-on-reading effect. They recruited 17 CSL learners who were aged 19 to 24 from a college Chinese class to learn Chinese characters either through character-writing or through pinyin-writing/typing condition. The data collected by fMRI suggested that CCW facilitates the connection with semantics and supports the facilitative effect on character reading. These studies consistently suggest a correlation between CCW and character reading in both native and non-native Chinese learners and provide evidence that character reading is supported by character writing.

2.2 Chinese Character Learning Strategies

In research on L2 learning strategy, the most commonly employed methodology is the self-reported questionnaire. Oxford's Strategy Inventory for Language Learning (SILL) (Oxford, 1990, pp. 283-299) is the primary one and has been adopted or modified to investigate CSL learners' strategies (Jiang, 2000; Jiang & Zhao, 2001; Liang & Ye, 2019; etc.). SILL classifies strategies into two types: direct and indirect. The direct type consists of memory strategies, cognitive strategies, and compensation strategies; the indirect consists of affective strategies, metacognitive strategies, and social strategies. Although SILL is a well-known, standardized and structured methodology, it was designed to identify strategies for

general L2 learning purposes in English-language teaching and learning contexts without addressing the specific properties of Chinese characters.

As each Chinese character has shape, sound, and meaning (corresponding to orthography, phonology, and semantics), to succeed in learning them, learners have to master all three linguistic components and establish links among them (Shen, 2005). Accordingly, some Chinese character learning strategies (CCLS) are related to the orthographic, phonological, and semantic components of characters. Hayes (1998) showed that CSL learners use a strategy that mixes the phonological and graphic encoding at the character level of processing. McGinnis (1995, as cited in Everson, 1998) and Zhou and Yu (2004) found that learners create their own idiosyncratic stories for Chinese characters with mnemonic associations that focus on pronunciation, meaning, or visual character. But others have reported that the radical strategies are greatly helpful and even more useful than creating stories based on the form of the Chinese character (Ke, 1998, Tseng, 2000, Zhao & Jiang, 2002). The role of sound, such as pinyin, in character learning is mainly for memorizing pronunciation (Yin, 2003) and does not appear to be as significant as practicing characters in the context of acquiring vocabulary and associating new characters with characters already learnt (Ke, 1998). Apart from strategies related to the orthographic, phonological, and semantic components of characters, there are a few other strategies which are also important to Chinese character learning, such as applying strategies and metacognitive strategies.

The studies of Jiang and Zhao (2001) and Shen (2005) developed a specific CCLS inventory; from these results and the factor analysis, we may obtain a general view of CCLS. Jiang and Zhao (2001) used classroom observation, interviews with both learners and their instructors, SILL, and previous research (McGinnis, 1995, as cited in Everson, 1998; Ke, 1998) to develop the first CCLS quantitative inventory, which consisted of 40 cognitive strategies and eight metacognitive strategies. They used this inventory to investigate CCLS among 136 beginning CSL learners in Beijing. The factor analysis showed six

factors (stroke strategy, paying attention to character shape as a whole, paying attention to pronunciation and meaning, applying strategy, review, and summary strategy) in the cognitive category and two factors (planning and monitoring) in the metacognitive category. The study reported that the strategies used are (listed from those used most often to most seldom) "memorizing the character shape as a whole, paying attention to its pronunciation and meaning, paying attention to its strokes, reviewing".

Shen (2005) is considered the most comprehensive study "to date in terms of investigating types of strategies learners used and the frequency of using the strategies" (Sung & Wu, 2011). She first used a semi-structured questionnaire which contained 12 open-ended questions to elicit character learning strategies. Next, 176 strategies were identified from this survey and 59 of them were used to construct the Character Strategy Inventory in order to measure how frequently the character learning strategies were used. Out of these 59, 30 (containing 25 cognitive strategies and five metacognitive strategies) were classified as commonly used strategies. The factor analysis revealed five cognitive factors (e.g., orthographic strategies; creating mental linkages among sound, shape, and meaning; using both aural-oral cues and writing in receiving and encoding information; using sound as cues to make connections to meaning and shape; and seeking various avenues to understand the syntactic functions of new characters) and two metacognitive factors (i.e., preview and review). The most frequently used strategy is the orthographic knowledge-based cognitive strategy, and the second most frequently used one is the metacognitive strategy. Based on Shen's study, Sung (2012) found seven most frequently used strategies; these included four stroke-orthographic-knowledge-based and three phonological-semantics-knowledge-based strategies. In 2014, Sung replicated her study, and the students were reported to "place emphasis on studying the aspects of characters and how they are used in sentences and conversation". Also, the study indicated there is a lack of strategies used to review Chinese characters.

Overall, CCLS studies have provided rudimentary findings that include various constructs of learning strategies adopted by CSL learners. The Chinese Character Learning Strategy Inventory (Jiang & Zhao, 2001) and the Character Strategy Inventory (Shen, 2005) played a substantial role in strategy identification and classification. Although there are a few other questionnaires for CCLS, such as those of Wang (1998), Tseng (2000), and Yin (2003), they often neither have a multivariate statistical procedure nor test reliability or validity. However, as the studies did not separate character recognition and production, we are not sure which strategies are used for CCW specifically. This limits our ability to fully understand how CLS students incorporate the unique properties of Chinese characters to be able to cope with CCW learning tasks.

2.3 The setting: International Schools in Hong Kong

International schools in Hong Kong include schools which "follow a non-local curriculum and whose students do not sit for the local examinations (e.g. Hong Kong Certificate of Education Examinations). They are operated with curricula designed for the needs of a particular cultural, racial or linguistic group or for students who wish to pursue their studies overseas" (Yamato, 2003). According to the Hong Kong Education Bureau (EDB) (February 2017), there were 51 international schools in academic year 2015/16, which provided 22,430 primary places and 18,676 secondary school places. Of the students enrolled in international primary schools, 16,281 were non-local and 4,158 were local; for secondary schools, the numbers were 13,599 non-local and 2,931 local. The demand for international primary school and secondary school places is projected to increase by 5 percent and 23 percent by academic year 2022/2023. The supply of such places is also projected to increase by 21 percent and 11 percent, respectively, by 2022/2023. The majority of these schools offer the International Baccalaureate (IB) curriculum. At the same time, many of them are affiliated with different nationalities and follow a particular national curriculum, such as the British

National Curriculum and Australian National Curriculum. The Chinese curriculum offered at such schools has to map to both IB and the specific national curriculum. In brief, international schools in Hong Kong provide an English-medium education, in which Chinese is one subject which receives different degrees of attention depending on the school. How Chinese is taught can be very different from school to school, but Chinese is rarely considered a major part of the school curriculum. Consequently, the teaching time for Chinese may not be enough; to a greater or lesser extent, the teaching of Chinese tends to emphasise language ability and to require character recognition more than production.

Take the largest international school organization, the English School Foundation (ESF), as an example. ESF has a long history with a diverse student body and an established Chinese curriculum. It is representative of international schools in Hong Kong. ESF operates 22 schools in Hong Kong and has 17,770 students from 75 different nationalities in its kindergarten, primary, secondary and special schools (ESF, 2020). ESF offers a fully English-medium learning environment. Chinese is a mandatory core subject in its kindergartens and primary schools, and a core subject in its secondary schools. A three-pathway Chinese program exists in all ESF primary and secondary schools and caters to CSL students with varying levels of Chinese proficiency and language background. Students learn simplified Chinese as a foreign, second or near-native language. Usually, the schools offer four to five Chinese lessons per week. However, the teaching and learning hours and materials will be different for students at varying levels. There are three Chinese benchmark tests for ESF students, given in years 6, 9 and 11, respectively. These tests provide information for placement in suitable pathways or suitable courses for the IB Diploma. In secondary school, "students will be assigned to the suitable IB Middle Years Program (MYP) Chinese language class from Year 7, and the IGCSE (British National Curriculum) Chinese language class for Years 10 and 11 (except the two IB all-through schools Renaissance College and Discovery College)" (ESF, 2020). Figure 1 is an example of a

curriculum map from one of the ESF secondary schools that shows the external academic requirements, e.g., GCSE, for the Chinese course (Cheung, 2016).

Figure 1. A Curriculum Map from One of the ESF Secondary Schools

(Source from Cheung, 2016)

2.4   Research Questions

This study is intended to develop an instrument, i.e., the *Chinese Character Writing Strategies Inventory* (CCWSI), to investigate two aspects regarding the specific actions CSL students employ for CCW learning. Firstly, the study aims to identify the commonly used CCW strategies among international school students. Secondly, it attempts to understand the underlying structure of CCW strategies. Three research questions will be addressed in this paper:

1. What CCW strategies are most frequently used or most seldom used by CSL students in international schools in Hong Kong?

2. How does the international school setting in Hong Kong influence the utilization of CCW strategies?

3. What categories or factors, if any, exist in the underlying structure of

CCW strategies?

3. THE CHINESE CHARACTER WRITING STRATEGY (CCWSI)

3.1 The Development of the CCWSI

Because there is no standard instrument for CCW strategies, we developed a questionnaire, the *Chinese Character Writing Strategy Inventory (CCWSI)*, to collect data for this study. Four steps were involved.

Step 1: As previous studies provided comprehensive CCLS in which CCW strategies overlap to a large extent with recognition strategies, a broad literature review was conducted in order to collect CCW items from the existing studies (Ke, 1998; Tseng, 2000; Yin, 2003; Shen, 2005; Sung, 2012; Jiang & Zhao, 2001; Lu & Peng, 2007; Liu & Jiang, 2003; Zhou & Yu, 2004; etc.). More than 400 questionnaire items were extracted and put together. Then similar items within one category were grouped, while multiplex items were rewritten and separated out. For example, the items from Ke (1998) were paired for the participants to judge which were more effective, and those items were edited as single statements: for example, "learning character components (radical and phonetic components) is more effective than learning stroke order" was rewritten as two items, "learning character components (radical and phonetic components)" and "learning stroke order".

Step 2: Repetitive and impracticable items were deleted. For example, the item "I go to the language lab and listen to the new words right before class" (Shen, 2005) was deleted because the language lab might not be available at some schools and/or for some learners.

Step 3: Items with similar "keywords" were categorized into groups. For example, the items with "radical" and "review" were put into "radical" and "review" groups. The items within the same groups were then evaluated, and those with similar meanings were combined. At the end of step 3, a total of 33 items were

collected (Appendix 1).

Step 4: The remaining items were discussed with four experts (two professors in the fields of Chinese Language Studies and Curriculum and Instruction Studies, a CSL instructor from a university, and a teacher from an international school). At the end of this step, two items (Q3 and Q13) were deleted. (To keep the item numbering consistent, Q3 and Q13 were kept in the questionnaire). Q3 ("When I write Chinese characters, if I forget the stroke order halfway through, I will guess") was originally designed to check if learners choose to guess strokes or the shape of a target character in order to finish writing when they forget the details of the character. However, the English description of Q3 was not precise enough. The statement "I will guess" could be understood from different perspectives, such as phonological or semantic perspectives, but not necessarily as guessing the strokes or the shape of the target character. Q13 ("When I write Chinese characters, I use pinyin if I don't know the character") was also deleted because it could be arguable. Using pinyin to replace writing characters does not aid CCW learning, but instead deviates from the acquisition of CCW.

Finally, a total of 31 items were used in CCWSI. To complete the questionnaire, a section on general information collection, such as age, gender, home language and so on, was also needed. An optional open-ended question that requests the students to write down additional information about their CCW learning strategies is also attached at the end of the items. Accordingly, the CCWSI contains two parts. Part 1 is the survey of demographic information and Part 2 contains 32 questions about the learning strategies employed for CCW. Except for the final open-ended question, the 31 items in Part 2 are rated by using 5-Points Likert Scale, which is adopted from SILL (Oxford, 1990).

1. This item is *never* or *only rarely* true of me.

2. This item is *sometimes* true of me.

3. This item is true of me about *half the time.*

4. This item is *frequently* true of me.

5. This item is *always* or *almost always* true of me.

The CCWSI has been written in both English and Chinese[29].

3.2 Participants

CSL students from an international school organization in Hong Kong were invited to evaluate their CCW learning through using paper-based or web-based CCWSI. A total of 26 hard copies of CCWSI were distributed to primary school students via their parents, and 19 responses were collected. The web-based CCWSI was made available to high school students and 24 high school students responded online. Altogether, we obtained 43 CCWSI responses from the primary school and high school groups (Table 1 & 2). The sample consisted of 49% female and 51% male participants with age from 7 to 17 (N = 43, M = 11.00, SD = 2.80). Participants were required to finish the questionnaire independently. However, as younger children from the primary school group might need some help from their parents to understand the meanings of some words, limited adult assistance was allowed. However, the adults were reminded that they should not interfere in any of the participants' choices. Participants hold various nationalities, including those of China, the US, Canada, several European countries, Australia, Korea, and India, but in each case at least one of their parents is a native Putonghua speaker. Thus, they are all bilingual speakers although they are more comfortable using English in their daily lives. Also, the participants are from families with high education levels; at least one of the parents has a master's or PhD degree. All participants had similar family and educational backgrounds.

Table 1. Participant details

Grade	Students	Age
Primary Group: Year 3 to 6	19	7-10

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29 See Ye (2020), the chapter "Development and Validation of the Chinese Character Writing Strategy Inventory" on *Character Teaching and Learning in L2 Chineses Classrooms: From Theory to Practice,* for more information of qualitative validation of the instrument.

(cont)

Grade		Students	Age
High School Group	Junior high school: Year 7 to 10	19	11-14
	Senior high school: Year 11 to 13	5	15-17
Total number of students:		43	

Table 2. Participant details: Frequency Distribution for Grade

Grade	Frequency	Percent
3	3	7
4	10	23.3
5	1	2.3
6	5	11.6
7	4	9.3
8	7	16.3
9	3	7
10	5	11.6
11	3	7
12	1	2.3
13	1	2.3

The Chinese course is taught for four to five hours per week in school. Simplified Chinese characters are used, and there are no standard textbooks. Teaching materials are prepared by Chinese teachers. The primary school uses the inquiry-based learning mode. Chinese teaching materials are designed to match the school inquiry topics. The high school uses some textbooks, such as the Singaporean textbook *Chinese Language for Secondary Schools and Higher Chinese,* as supplementary teaching materials. For Chinese character teaching, the school adopts a meaning-centered approach mainly based on dispersive learning of characters (分散識字). Chinese characters are taught when encountered within texts. The Chinese class was divided into three levels in this school. All participants in this study were from the highest-class level.

4. RESULTS OF DATA ANALYSIS

Among the 43 CCWSI responses, a few missing values from the paper-based CCWSI were substituted by using mean values. Data analysis was carried out by using SPSS 25 (IBM, New York).

4.1 The High Frequently Used Strategies and the Low Frequently Used Strategies

Based on the descriptive analysis, strategies are divided into two types based on their relative frequency of use (high and low); they are shown in Tables 3 and 4. If an item listed on CCWSI has a mean above 3, the mode should be 4 or 5. Thus, it may be categorized as a high frequently used strategy. Among all the responses, we found that the high frequently used items are Q16, Q6, Q9, Q18 and Q10, as listed in Table 3. Q16 has the greatest number of participants (frequency) who chose options 4 or 5, with a sum of 23 out of 43 people. The mean of low frequently used strategy is below 3 when the item mode is 1 ("*never* or *only rarely* true of me") or 2 ("*sometimes true of me*"). The low frequently used strategies among all responses include Q24, Q27, Q20, Q33, Q21, and Q32, as listed in Table 4. Q32 has the greatest number of participants (frequency) who chose options 1 or 2, with a sum of 34 out of 43 people.

4.2 Factor Analysis

4.2.1 Exploratory Factor Analysis (EFA)

To uncover the underlying structure of CCWSI and identify the underlying relationships with an individual CCW strategy, an exploratory factor analysis (EFA) was conducted by using SPSS 25 (IBM, New York) on the 43 sets of responses of the 31 strategy items. The principal components analysis (PCA) method and Varimax rotation were used for EFA.

Both the Bartlett's test of sphericity (Bartlett, 1951; Gorsuch, 2014) and Kaiser-Meyer-Olkin measure of sampling adequacy were checked to assess the

Table 3. The Most Frequently Used Strategies

Questions	Mean	Mode	Frequency					
			1	2	3	4	5	4&5
Q16	3.37	4.00	4	9	7	13	10	23
Q6	3.30	5.00	8	5	9	8	13	21
Q9	3.30	5.00	8	5	9	8	13	21
Q18	3.19	4.00	3	11	10	13	6	19
Q10	3.12	4.00	6	7	1	14	5	19

Q16. Recall specific characters in the context of compounds
Q6. Pay attention to the graphic structure
Q9. Write repeatedly and learn characters by rote
Q18. Pay attention to semantic components
Q10. Pay attention to the shapes of characters

Table 4. The Least Frequently Used Strategies

Questions	Mean	Mode	Frequency					
			1	2	3	4	5	1&2
Q24	2.26	1.00	18	11	5	3	6	29
Q27	2.12	1.00	24	5	3	7	4	29
Q20	2.00	1.00	23	7	6	4	3	30
Q33	2.00	1.00	25	6	4	3	5	31
Q21	1.84	1.00	22	12	5	2	2	33
Q32	1.81	1.00	22	12	4	5	0	34

Q32. Play games
Q21. Check plan and reflect on progress
Q33. Practice calligraphy
Q20. Plan for CCW
Q27. Create stories to help memorization
Q24. Preview/study before class

factorability of the data. A scree plot was employed to help with the identification of the number of factors which could be extracted. The results showed that the Bartlett's test of sphericity was significant ($\chi 2$ (465) = 859.62, $p<.001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=0.62) was acceptable (Kaiser & Rice, 1974), indicating that the current dataset is suitable for factor analysis.

The result of the scree lot suggested that an optimal two factors could be

extracted (Figure 2). The pattern matrix of the two-factor solution is displayed in Table 5 with the larger factor loading bolded. Items with factor loading larger than 0.3 were taken as acceptable (Hair et al., 2010). The first factor contains 16 items, with factor loading ranging from 0.31 to 0.79, which explains 22.28 percent of the total variance. The second factor was composed of 15 items, with factor loading ranging from 0.34 to 0.80, which explains 21.48 percent of the total variance.

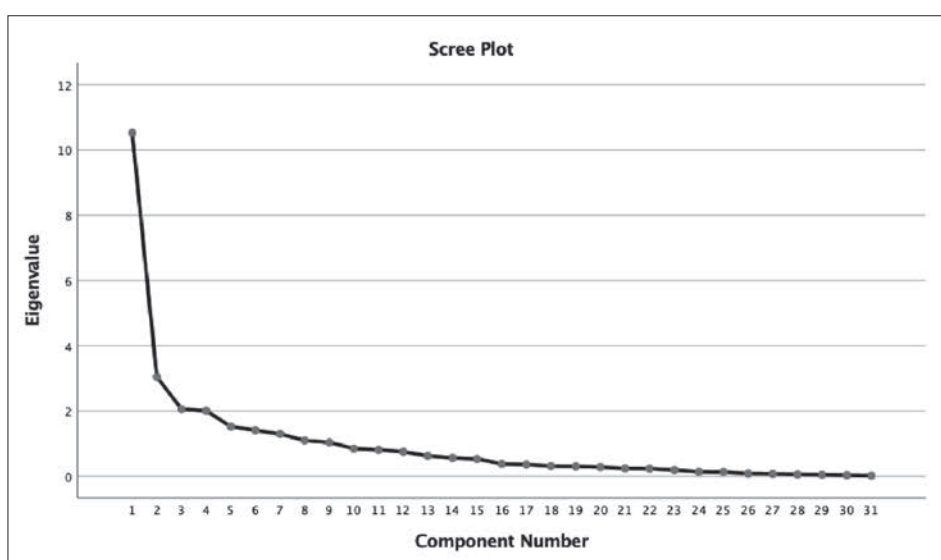**Figure 2. The Results of the Scree Plot**

Table 5. Pattern Matrix of Two-factor Solution

	Factor 1	Factor 2			Factor 1	Factor 2
Q1	0.304	0.464		Q20	0.709	0.2
Q2	0.312	-0.012		Q21	0.611	0.479
Q4	0.222	0.338		Q22	0.713	0.249
Q5	0.397	0.522		Q23	0.685	0.465
Q6	0.265	0.593		Q24	0.671	0.085
Q7	0.071	0.369		Q25	0.648	0.216
Q8	0.284	0.583		Q26	0.525	0.394
Q9	0.248	0.444		Q27	0.248	0.524
Q10	0.199	0.777		Q28	0.786	0.241
Q11	0.648	0.087		Q29	0.746	-0.089
Q12	-0.007	0.736		Q30	0.39	0.165

(cont)

	Factor 1	Factor 2			Factor 1	Factor 2
Q14	0.188	0.529		Q31	0.605	0.148
Q15	0.131	0.732		Q32	0.602	0.291
Q16	0.156	0.578		Q33	0.389	0.231
Q17	0.08	0.796		# items	16	15
Q18	-0.072	0.745		Proportion of variance	0.22	0.21
Q19	0.691	0.507		Cronbach's Alpha	0.91	0.88

Note: 1. Principal Components Analysis and Varimax rotation were used.
2. Factor loadings higher than 0.3 are in bold.

Item-total correlation and Cronbach's alpha if Item Deleted (Table 6) were performed in order to ensure that each item was significantly related to the other items in its factor. According to Cristobal et al. (2007), the minimum value for retaining each item is 0.30. However, for an exploratory study 0.20 is an acceptable value for item-total correlation. Q2 in factor 1 had 0.238 for item-total correlation, and the Cronbach's alpha if Q2 deleted was 0.913, which was the same as the 0.91 of the original Cronbach's alpha of factor 1. Q2 was acceptable for retain. The items in factor 2 had the smallest 0.32 for item-total correlation, and if we delete any item in this factor, the Cronbach's alpha of the factor will not be increased. Thus, no item should be dropped.

Table 6. Item-total correlation and Cronbach's Alpha if Item Deleted

Factor 1	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted		Factor 2	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q19	0.779	0.897		Q10	0.744	0.865
Q23	0.761	0.897		Q15	0.703	0.867
Q28	0.76	0.898		Q17	0.687	0.867
Q22	0.728	0.9		Q12	0.609	0.87
Q21	0.682	0.901		Q8	0.578	0.872
Q20	0.648	0.901		Q18	0.573	0.872
Q32	0.634	0.902		Q6	0.554	0.873
Q25	0.62	0.902		Q5	0.543	0.873

(cont)

| Factor 1	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted		Factor 2	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q11	0.601	0.903		Q27	0.521	0.874
Q26	0.597	0.903		Q16	0.508	0.875
Q29	0.579	0.903		Q14	0.508	0.875
Q24	0.574	0.904		Q9	0.461	0.877
Q31	0.559	0.904		Q1	0.458	0.877
Q33	0.385	0.91		Q7	0.369	0.882
Q30	0.374	0.91		Q4	0.323	0.882
Q2	0.238	0.913				

4.2.2 Factors Interpretation

In order to interpret these factors, we went through the content of each of the items. Factor 1 had 16 items, and all items were loaded to "indirect strategies" except Q2 ("When I write Chinese characters, I follow the stroke order"). These strategies, except Q2, can be categorized into metacognitive strategies, affective strategies, social strategies, and compensation strategies as described in Oxford (1990), and applying strategies (Jiang & Zhao, 2001). These are not directly related to the knowledge of Chinese characters and thus we named factor 1 items as "indirect strategies". The number of factor 2 items were 15 in total. These items were related to learning CCW by obtaining orthographic, phonologic, and semantic knowledge of Chinese characters.

According to the factor analysis above (Table 5 and 6), a Cronbach's alpha analysis was further conducted to check the reliability of the strategy items grouped by these two factors. The result of the Cronbach's alpha analysis for 16 items in factor 1 was 0.91 and for 15 items in factor 2 was 0.88. To better measure of internal consistency, McDonald's omega was also performed, and the results aligned with Cronbach's alpha (0.91 and 0.88). There was a clear internal consistency among the strategy items for both factor 1 and 2.

4.2.3 Strategy Preference by Participants

CSL students in international school tended to use more knowledge-based strategies from factor 2 than indirect strategies from factor 1, as shown in Figure 3, where the mean of factor 1 items is lower than factor 2 items in general. At the same time, the five most frequently used strategies all belong to factor 2 (although Q3 was dropped from factor 2). Five out of the six least frequently used strategies belong to factor 1.

Figure 3. Mean of Factor 1 and 2 Items
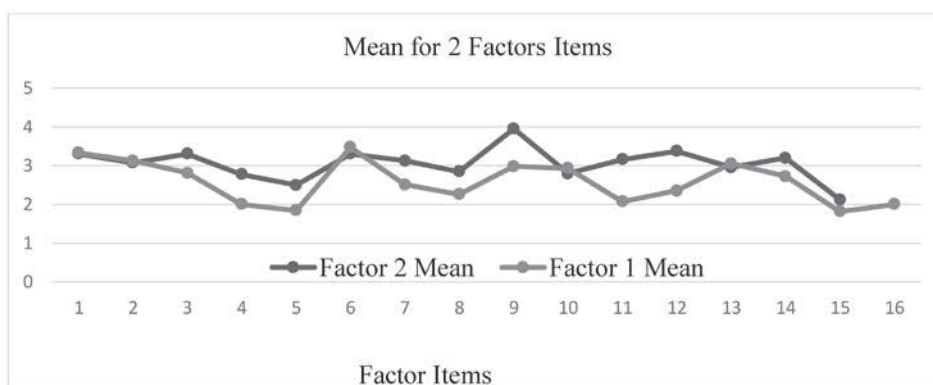
5. DISCUSSION

This study developed a questionnaire, i.e., the CCWSI, to investigate CCW strategies and international school students' preferences in approaches to learning CCW. The CCWSI contains 31 strategic items. The overall reliability (0.929 Cronbach's alpha) and reliability of subscles (0.91 and 0.88 Cronbach's alpha) were high, which indicates that the CCWSI measured the same type of construct. From factor analysis, two dimensions were found for CCW learning strategies under CCWSI: knowledge-based strategies and indirect strategies. Each of them captures a certain amount of the overall variance and together can explain the 43.76 percent variance. The knowledge-based strategies (factor 2) involve orthographic, phonologic, and semantic knowledge of Chinese characters. it's particularly useful in CCW, but not in other language learning. This dimension is

similar to the cognitive strategies in Shen's (2005) inventory but not, however, to the cognitive strategies in Jiang and Zhao's (2001) inventory because it included reviewing strategies. The indirect strategies (factor 1) in our study are different from SILL because we include applying strategies. Applying strategies belong to the cognitive construct in Jiang and Zhao's (2001) inventory as well as in SILL; however, cognitive strategies are direct strategies according to Oxford (1990). In brief, CCWSI have similarities with SILL, with Jiang and Zhao's (2001) inventory, and with Shen's (2005) inventory. They all have a two-factor first layer structure. Unlike the direct and indirect dimensions in SILL, or the cognitive or metacognitive dimensions in the other two Chinese character learning strategy inventories, our two factors consist of knowledge-based strategies and of indirect strategies which were derived from knowledge-based strategies. There may be more categories or subfactors that exist under the two factors mentioned above, but our sample size is not big enough for further exploration.

Based on the results of our data analysis, the most frequently used strategy was Q16 "recalling characters in the context of compounds", followed by Q6 "paying attention to the graphic structure", Q9 "repeatedly learn them by rote", Q18 "paying attention to semantic components", and Q10 "the shape of characters". In the international schools, students usually use pinyin to input Chinese compound words for online assignment submission from late elementary to high school, so students are used to recalling characters in the context of compounds. This strategy is also good for distinguishing homophones. It is the most frequently used strategy for learning meaning and has a large and significant impact on Chinese character reading and recognition, as reported in previous studies (Ke, 1998; Yin, 2003).

The orthographic strategies are useful for mastering the shape of characters or graphic production, and radical and context strategies are advantageous in understanding the meanings (Ke, 1998; Yin, 2003; Sung, 2012, 2014). The international school students use context strategies (Q16) along with semantic components (Q18) and orthographic strategies (such as Q6 and Q10) when

they write Chinese characters. Using context strategies depends on learners' morphological awareness, which involves learners' "conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate that structure" (Carlisle, 1995). Bonin et al. (2004) proposed that semantically mediated writing is a dominant strategy in cases with many homophones. With a better morphological awareness, learners find the mapping between meaning and orthography of morphemes easier (McBride-Chang et al., 2003). As bilingual speakers, the international school students have a relatively good morphological awareness, and this might drive them to choose strategies which are associated with the monosyllabic features of Chinese.

Paying attention to the graphic structure of characters (Q6), the semantic components of characters (Q18) and the shape of characters (Q10) were strategies also frequently used by the international school students. These involve the analysis and summarization of the characters' structure and shape. The international school students who are living in Hong Kong are exposed to Chinese characters in daily life. They have developed a good orthographic awareness, and understand the components of characters and the graphic structure of Chinese characters well. Thus, they are different from the CSL students in Jiang and Zhao's (2001) report and do not use a whole-character strategy. According to Oxford's definition (1990), analyzing and deconstructing the graphic structure and comparing the similar shapes of characters are categorized as cognitive strategies.

As for the strategy of repetition (Q9), many studies have pointed out that repetition is a common strategy in Chinese character learning (McGinnis, 1999; Tseng, 2000; Yin, 2003; Zhao & Jiang, 2002; Zhou & Yu, 2004). However, its effectiveness is uncertain. Zhao and Jiang (2002) stated that it is not effective, but Zhou and Yu (2004) concluded it is effective for novices.

Based on the results of data analysis, one of the least frequently used strategies was Q32 "playing games, including computer games". As there are not many fun digital games that involve the writing of Chinese characters (Lin et

al., 2008; Hao et al., 2010), and the school did not apply CCW games in Chinese teaching or recommend any CCW games to students, the learners do not use game strategies in their CCW learning. As for why calligraphy strategies (Q33) were uncommon in the international school, we suspect that it is because there is no after-school calligraphy program and so the students do not practice calligraphy frequently. Q32 and Q33 were restricted by the conditions of teaching.

Moreover, the students do not like to use metacognitive strategies, such as Q20 "making a study plan", Q21 "checking or reflecting on the plan", and Q24 "previewing before class". The metacognitive strategies involve a deeper level of process of characters (Liu & Jiang, 2003), but the students do not pay enough attention to its importance. The result was not consistent with Shen's (2005) finding. The reason behind this difference might be the participants' ages. Shen investigated adult learners, while our subjects were children and teenagers. Another reason is the unit-based curriculum in the international school which results the Chinese learning materials need align to the unit inquiry and no systematical textbook is followed at the primary school level. With the limited school lessons and afterschool assignments, though metacognitive strategies are generally applicable, they don't integrate into learners' Chinese learning in the international school setting.

Another less frequently used strategy is Q27: "creating stories" for better memorization. McGinnis (1999) reported that this is one of the most commonly used strategies while Ke (1998) suggested an opposite finding. This might be due to the difference in the nature of their participants. McGinnis investigated 29 year-one college CSL students, whereas the participants in Ke's study were 85 heritage learners and 60 CFL learners. In our study, the backgrounds of bilingual international school students make them more like the heritage learners in Ke's study. As mentioned above, they have a better understanding of orthography and frequently use strategies based on orthographic knowledge, such as Q6 and Q10, which are more helpful than creating stories (Ke, 1998; Zhao & Jiang, 2002).

However, the findings for whether the learners' background will affect their learning strategies are not consistent. Ke (1998) argued that whether the students are heritage or non-heritage learners did not affect their Chinese character learning strategies in terms of recognition and production of Chinese characters. Unlike Ke (1998), Yang (2018) did a comparative study of CCW between elementary-level heritage and non-heritage learners. He found that heritage learners have a higher rate of writing accuracy. Jiang and Zhao's (2001) study also indicated that learners' background is important for learning strategies. Because of the limited number of participants in our investigation, further study is needed to consider students from different backgrounds in order to better address this question.

All in all, the students were more likely to choose knowledge-based strategies than indirect strategies. Learners' choice of CCW strategies was more or less influenced by the school setting, such as school resources, assignments, teaching methods and curriculum. As the process of CCW involves deconstructing the strokes and components and then regrouping these sub-characters into a square linguistic unit (Tan et al., 2005), learners not only rely on simple memory or single skills during writing, such as motor skills and visual-perception skills, but also integrate different kinds of systematic knowledge involved in the writing system, including orthographical, phonological and morphological components of the characters (Ho, Yan & Au, 2003). Although the process of decoding writing seems to be on the visual orthographic level, it actually links visual symbols, phonological codes and semantic codes. Therefore, partial information can lead to successful recognition, but for accurate production, learners must have complete knowledge to transform such knowledge into hand movements (Ke, 1996). Some research has already pointed out that orthographic skills, phonological skills, and morphological awareness are important for learning Chinese writing (Ho, Ng, & Ng, 2003; McBride-Chang & Ho, 2005; Chan et al., 2006; Shu et al., 2006; etc.). Consequently, strategies which are based on orthographic, phonological, and semantic knowledge are more direct and important for CCW.

5. CONCLUSION

This study first developed an inventory (the CCWSI) for identifying CCW strategies used by international school students. only focus on the visual orthographic level but also link visual symbols with the phonological and semantic components of Chinese characters. Meanwhile, teachers should encourage students to make a plan of study (such as preview, review, and reflection). They should also provide more social opportunities for using Chinese characters and encourage students to write Chinese characters inside or outside the classroom.

This study provides a general and comprehensive picture of CCW learning strategies. The CCWSI is a useful tool to induce students to become self-empowered learners. Although EFA helped us find a two-factor structure for CCWSI and decided the items under the two dimensions, this study did not provide adequate data to allow confirmatory factor analysis (CFA), which seeks verification of the categories of strategies proposed. Furthermore, our sample size was limited and was not sufficient to explore sub-dimensions under these two factors. The two factors explain only about half of all variances, so there are still other factors that impact CCW learning strategies, such as gender, language background, proficiency level, motivation, etc. In the further study (Ye, 2020), we increased our sample size to at least 10 to 15 times the observed variables (Thompson, 2000) and assessed the validity of CCW. Correlational analysis will also be introduced in future studies to investigate whether performance in Chinese language and character learning is predictable in the use of CCW strategies. As such, we can better consider the factors which affect CCW learning strategies while looking back at learning outcomes.

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國際學校漢語二語學習者漢字書寫學習策略初探

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摘要

本研究調查了香港國際學校學生的漢字書寫學習策略。我們首先發展制定了漢字書寫學習策略量表。通過描述性統計分析，我們發現香港國際學校學生最常用的學習策略與漢字意義、結構以及字形相關；而最不常用的學習策略是遊戲、書法、和元認知策略。因素分析進一步揭示漢字書寫學習策略分為兩個主要因素：基於漢字本身知識的策略和間接學習策略，表明漢字的特性和書寫認知過程共同影響學生對漢字書寫學習策略的使用。根據研究結果，本文提出了一些相應的教學方法和改進建議。

關鍵詞：漢字書寫　學習策略　漢語二語學習者　國際學校

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