Project Title: An investigation of strategies and methods in learning Chinese vocabulary by non-Chinese speaking students in Hong Kong

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Final Report

by

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Abstract

This project aimed to investigate the use of strategies in incidental learning of Chinese vocabularies by Hong Kong Non-Chinese speaking (NCS) students. It helps capture a comprehensive picture of lexical processing strategies used by second language (L2) learners' and their effectiveness in vocabulary learning. The investigation should provide empirical evidence to the design of pedagogical plans and training methods targeting NCS students. We conducted intervention studies and questionnaire surveys to identify strategies that NCS students use in reading tasks, and to evaluate their use of Chinese dictionaries. We found that in reading, students inferred meanings of unfamiliar words using a combination of linguistic cues and methods. Low frequency of dictionary use was also recorded. Results revealed a minimal role of dictionary use in acquiring new vocabulary by the NCS students. Many students were beginners or intermediate learners of vocabulary learning strategy uses. A follow-up delayed experiment revealed rather low rates of word retention, which suggested that most of our NCS students may have stopped at recognition of unfamiliar words. We propose that strategy training should be provided to NCS students, especially those at advanced beginning and intermediate levels. The training could focus on developing awareness of strategy use for incidental vocabulary learning. Supportive measures for Chinese dictionary use, including pedagogical instructions and development of Chinese dictionaries designated for L2 learners, are urgently called for.

Keywords: Chinese as a second language; lexical processing strategies; Non-Chinese-speaking students; reading and writing; use of dictionaries; vocabulary learning

1. Introduction

Chinese proficiency of Non-Chinese speaking (NCS) students in Hong Kong has long been found less than satisfactory. It has been noted and confirmed that the Chinese proficiency, particularly in reading and writing, of majority NCS students is far lower than their English skills, and also lower than that of their same-aged Chinese peers. Of all the problems in teaching and learning Chinese, vocabulary seems the core and yet most challenging and difficult to young second language (L2) learners of Chinese. As a single unknown character or word may lead to incomprehensibility of a sentence or even an entire text, research on both first language (L1) and L2 acquisition has paid extensive attention to the role of vocabulary in language development and the means to improve vocabulary learning. ocabulary acquisition is understood as an important predictor of effective reading comprehension, and of general language ability (Anderson & Freebody, 1981).

In L2 lexical teaching and learning, there are two types of vocabulary learning: intentional learning and incidental learning (Nation, 1990). Intentional learning is defined as being designed, planned for, or intended by teacher or students, whereas incidental learning is a by-product of doing or learning something else. In terms of vocabulary learning, incidental learning refers to learning new words through texts, working on tasks or doing other activities that are not directly related to vocabulary (Nation, 1990). Learning vocabulary incidentally through reading in context fosters an elaborate processing of words and facilitates its retention in memory (Huchin & Bloch, 1993; Nation, 1990) and thus is an important and effective approach in vocabulary acquisition.

Incidental L2 vocabulary learning occurs during reading comprehension. The effectiveness of incidental learning is significantly influenced by strategies learners use for lexical processing. As a result, the way learners deal with unknown words during reading has become the focus of many empirical studies in recent years (e.g., Nassaji, 2003, 2004; Hu & Nassaji, 2014; Fraser, 1999; Huckin & Bloch, 1993; esche & Paribakht, 2010). To our knowledge, however, little effort involving local NCS students has been documented in literature on their use of lexical processing strategies. Facing the imminent need of improving Chinese proficiency of the young NCS students in Hong Kong, the Education Bureau (EDB) has addressed the needs for cultivating the ability of self-learning among NCS students by publishing guidelines, including Supplementary Guide to the Chinese Language Curriculum for Non-Chinese Speaking Students (Hong Kong Education Bureau, 2008) and Provision of Consultancy Service for a Study on Good Practices in Primary and Secondary Schools to Support Non-Chinese Speaking Student (Hong Kong Education

Bureau, 2010). Upon the concerns, dictionaries appear to provide an economic and immediate means to implement as a pedagogical solution and remedy in local schools. Based on these considerations, this project aims to investigate strategies in incidental learning of Chinese vocabularies by Hong Kong NCS students. We carried out intervention studies and questionnaire surveys to identify strategies that NCS students use in learning Chinese vocabulary in reading tasks, and to evaluate the use of dictionaries (printed, online, and electronic) and its effectiveness as a self-learning tool for these students. In light of the above discussion, the following research questions were addressed:

(1) How do NCS students deal with new words in reading and writing? Are there strategies and methods identifiable in the process?

(2) Is there any impact of strategies-focused training on vocabulary learning by NCS students?

(3) Do NCS students use dictionaries and what role do dictionaries play in vocabulary learning among NCS students?

We hope that findings from this project will contribute to the development of effective pedagogical methodologies for Chinese-as-a-second-language (Chinese as L2) vocabulary learning.

2. Review of literature

Traditionally, researchers have identified three kinds of strategies L2 learners use when they encounter an unfamiliar word during reading, i.e., to ignore and continue reading, to consult a dictionary, or to infer word meaning on the basis of linguistic and contextual cues (Fraser, 1999; Nation, 1990). The use of three strategies will be reviewed as follows.

The first strategy is ignoring, which is seen as an unproductive lexical processing strategy in incidental learning. As attention to an unfamiliar word is prerequisite for learning (Ellis, 1994; Gass, 1988; Schmidt, 1994), frequnt ignoring would limit the learning potential (Fraser 1999). Some research suggested that when L2 learners are left on their own to deal with new words, they generally ignore them and only infer when there is a specific need (Bensoussan & Laufer, 1984; Paribakht & Wesche, 1997). However, Fraser (1999) also reported that the rate of ignoring words decreased with instruction.

The second strategy is consulting. Research on dictionary use has shown that L2 learners who consult a dictionary when dealing with new words may have a better performance on vocabulary learning and word retention (e.g., Fraser, 1999; Knight, 1994; Luppescu & Day, 1993). Similar positive roles of dictionaries in learning Chinese vocabulary are also recorded among NCS students (Li, 2009; An & Yi, 2008) and learners of Chinese-as-a-foreign-language (CFL) (Wang, 2009; Du, 2010; Zhang, 2011). Despite the rich evidence to the facilitative roles of dictionaries, research has observed that learners would consult a dictionary sparingly and on a very selective basis in such situations (Bensoussan & Laufer, 1984; Paribakht & Wesche, 1997). Teachers of Chinese also seemed not to have fully recognized the pedagogical importance. In a survey on

dictionary use in classrooms, Du (2010) found only 3.4% of the teachers had emphasized the importance of dictionaries to students, and most teachers only mentioned briefly the use of dictionaries but gave no instruction on how to use them.

Previous studies on Chinese and English education also confirm that dictionary use has a significant effect on enhancing self-learning skills. In conformity with the EDB's policies on promoting self-learning by NCS students, dictionaries seem to be the most ready-to-use solution and immediate pedagogical remedy. However, compared to the enthusiasm in research and practice in other regions of the world, very little attention has been given to the relationship between the dictionary use and learner needs in Hong Kong.

The third strategy is inferencing, which exploits linguistic and contextual clues and learners' various knowledge sources. This is the most widely adopted strategy by L2 learners (Fraser, 1999; Paribakht & Wesche, 1999). Inferring word meaning can be classified into inferencing based on contextual cues and linguistic cues. Of all linguistic cues, our project focuses on morphological and radical cues, as morphological and radical awareness play an important role in identifying characters and words in Chinese orthography (e.g., Kuo & Anderson, 2006; McBride, 2016; Tong et al., 2009).

Chinese characters, as the basic units of the Chinese writing system, can be classified into two categories in terms of their internal structure: integral characters and compound characters. An integral character contains only one radical, while a compound character consists of two or more radicals. Therefore, radicals are the basic orthographic units in characters. They can be further classified into phonetic radicals and semantic radicals. About 90% of modern Chinese characters are phonetic-semantic compound type (Shen 2005). Each compound character contains at least two radicals, one indicating the sound and the other its meaning. Each character typically corresponds to a morpheme (Zhang & Peng 1992). Characters can combine with others to form words (Taft, Liu & Zhu 1999). For CSL learners, recognition of characters and words has been a challenge for the dissociation of form, sound, and meaning in Chinese orthography. But learners could find hints about meaning from roots or affixes, although such link does not always hold. For learners to benefit from such meta-awareness, however, they must have acquired a good number of Chinese characters (Li, 2017). Traditionally, research on the role of radical awareness skill highlights its importance for character recognition (Ho et al., 1999; Leong et al., 2011). However, it may also facilitate lexical inferencing process, although its reliability may vary. So, we proposed that analysis of radical information may provide a useful basis for CSL beginners to infer the meaning of a new word from its character components (i.e., comprehension based on sub-lexical analysis) to word comprehension (i.e., comprehension based on connections between characters).

In Chinese, the predominant morphological process in word formation is also compounding. Given that over 80% of Chinese words are compounds, identification and understanding of each morpheme and the underlying structure can help NCS students guess the meaning of a new word that is comprised of

morphemes they already know (Zhou et al. 2017). Training of skills relating morphological awareness has been shown effective in improving both Chinese vocabulary and word-reading abilities (e.g. Chow et al., 2008; Wang, Cheng, & Chen, 2006). Researchers have noted the primacy of morphological cues in the inferencing process (Bensoussan & Laufer, 1984; Huckin & Bloch, 1993), because familiarity with common morphemes can provide a fast and automatic way for identifying connections between related morphemes.

In addition to relying on radical and morphological cues, CSL learners could also use contextual cues when dealing with new words. Such skill has been found useful by scholars such as Nation (2001) and Parel (2004), who all emphasize the importance of inferencing from contexts in vocabulary learning and in improving reading skills. Fraser (1999) observed that L2 learners made use of contextual cues more frequently than word-form-based cues when inferencing. However, researchers (Bensoussan & Laufer, 1984; Hulstijn, 1992) have also found that inferring is not always an easy or efficient strategy for L2 learners to use, because the text may not provide sufficient clues to infer, or L2 learners often do not make use of available cues or misuse them.

3. Theoretical and/or conceptual framework

This project adapted the framework proposed by Béjiont (1981) on dictionary use and that by Fraser (1999) on lexical processing strategies in reading comprehension. The design of questionnaire on Chinese dictionary use was mainly based on Béjiont (1981), and supplemented with our review of questionnaires used in previous research on EFL learners in Japan (Baxter, 1980), and in China (Zhao, 2004; Zhang, 2006). Adapting the approach by Fraser (1999), the intervention study in this project consisted of two parts: vocabulary learning strategy training and individual interview. Strategies and methods of focus were ignoring, consulting a dictionary, and inferencing based on linguistic and contextual cues.

4. Methodology

This project aimed at a comprehensive investigation of methods and strategies NCS students use to learn Chinese vocabulary. We employed quantitative research methods to collect demographic information of the participants and their responses on the awareness and use of Chinese dictionaries, and also an intervention study tracking the strategies these students used in tackling new words in comprehension tasks. In view of previous research on the importance of radical and morphological knowledge in the process of character and word learning, tasks focusing on radical and morphological identification were added to to evaluate radical and morphological awareness of the students.

4.1 Participants

The participants were 237 non-Chinese speaking (NCS) students from 2 English-as-medium-of-instruction (EMI) primary schools and 1 EMI secondary school in Hong Kong. There were 129 female students and 102 male (with 6 missing information), aged from 7 to 19, with an average of 13.8. Of all participants, 120 were born in Hong Kong (second generation immigrants or above) and 112 immigrated to Hong Kong after birth

elsewhere (first generation immigrants) (with 5 missing information). The distributions of the students' ethnicity are shown in table 1.

Among all participants, 32 of them took part in vocabulary learning strategy study on a voluntary basis. 22 were girls and 7 were boys (with 3 missing information). The average age of the students was 13.5.

Table 1 Distributions of the participants' ethnicity

Ethnicity	FG	SG or above
Pakistani	37	75[1]
Indian	9	
Nepalese	36	22
Philippine	22	16
Thai	3	5
Others	5	2

Note: Others include Mainland China, Bangladeshi etc. FG = first generation immigrants; SG = second generation immigrants

4.2 Instrument and Procedure

We designed a questionnaire that consisted of two parts. There were a total of 35 questions. Part I involved 16 questions to elicit participants' demographic information, including gender, age, country of origin, parents' languages and education levels, data relating language learning such as age starting to learn Chinese, the medium of instruction in school, proficiencies in major languages and their phonic systems where applicable, and data relating L1 use and attitude. Part II involved 19 questions focusing on Chinese dictionary use. It was composed of four subparts, including dictionary type, usefulness of dictionary, reference skill and instruction of dictionary use (attached as Appendix). The questionnaire consisted of multiple choices and open-ended questions. For multilingual and Romanized scripts proficiencies, we used 5-point Likert scales with 5 being the highest for the participants to separately self-assess their listening, speaking, reading and writing skills in each of the four languages: English, Cantonese, Mandarin, and L1, as well as their knowledge of Romanized scripts in terms of reading and writing abilities.

We designed brochures and fliers that contained description of our research purposes and methods. These materials were posted online and also sent to major schools where large numbers of NCS students are enrolled. We recruited students on a voluntary basis. All participants younger than 16 must return our consent forms signed by their parents/guardians, before joining in the study. The questionnaire survey was administered by the researchers with help from teachers in the participating schools. When an informant had problem understanding an item or a specific word, the researchers offered explanation and followed up until the informant understood it. All participants were compensated with book coupons for their time spent in our study.

[1] We identified the ethnicity of second generation immigrants or above (SG or above) based on their reported L1, some of which were native to both Pakistan and India. In light of this, the numbers of SG or above who spoke these languages were counted under the same group.

Participants who engaged in the vocabulary learning strategy study attended a reading and a post-reading session. In the reading session, they were tested individually on a reading comprehension task, a vocabulary learning strategy task and a series of post-reading tasks. At the end of the session, they completed a vocabulary test and a questionnaire on demographic information and Chinese dictionary use. 1 week after the reading session, a vocabulary post-test was conducted in group. All oral instructions were provided mainly in Cantonese and instructions in printed materials were provided in both English and Chinese.

4.3 Measures of the intervention study

4.3.1 Literacy proficiency (reading and writing proficiency)

The participants were asked to report and self-assess their proficiency levels of Chinese literacy in terms of reading and writing abilities. The assessment was based on a 5-point scale with 5 being the highest, totaling a full mark of 10 for the overall literacy proficiency level.

4.3.2 Reading comprehension

Two texts taken from an academic textbook of primary level were selected as the reading materials in the reading comprehension test. The lengths of the first and the second texts were 263 words and 485 words respectively. Participants first studied comprehension short questions, read a text, and answered the questions. The reading comprehension of the first text containing 3 questions was taken as a practice trial. There were 4 questions for the second text, three of which assessed students' understanding of the meaning of passage, while one of which assessed the understanding of the meaning of 2 vocabulary items. Two points were awarded for each answer that was accurate, and one point was given for a partially correct answer. The total score was 10.

4.3.3 Vocabulary learning strategies

An oral interview was conducted to identify and code vocabulary learning strategies used by students during reading. Before reading, a strategy training on tapping the awareness of the use of five vocabulary learning strategies (inferencing based contextual, morphological or radical cues, consulting dictionaries, and ignoring) was introduced to all participants. After the reading task, participants were asked to circle unknown words in the second text. In addition to items indicated by participants as unknown, there were 12 words selected from the text as target items. They were asked to attempt to infer the meanings of the target words and engage in a retrospective think-aloud procedure by reporting vocabulary strategies they had used to deal with target words while reading. In addition to the five strategy use options, mixed patterns with a combination of strategy uses and strategy uses other than the five options were also recorded. Participants' use of the vocabulary learning strategies was estimated by calculating their frequency of use.

4.3.4 Chinese vocabulary knowledge

To measure vocabulary knowledge of the students, they were asked to complete a vocabulary test. A total of

60 words (single- or two-character words) were selected as test items. Most of these words were chosen from Hong Kong Chinese Lexical Lists for Primary Learning (Curriculum Development Institute, 2007) developed by the Education Bureau of the Hong Kong SAR government. Among the 60 items, 49 were categorized as the first learning phrase (Primary 1 to Primary 3). 8 were categorized as the second learning phrase (Primary 4 to Primary 6), while 3 were not included in the lists. To maintain a similar difficulty level to word items found in the lexical lists for primary learning, the three word items consisted of a character that were repeated across multiple words found in the lexical lists. For example, although the sampled word item 購物 *gau3mat6* 'shopping' was not found in the lexical lists, the character 購 *gau3* 'to purchase' was repeated across words like 購買 *gau3maai5* 'to buy' that were under the lexical lists. Students were instructed to self-report their understanding of the word meanings. Each correct answer was awarded one point and the total score was 60.

4.3.5 Vocabulary post-test

The vocabulary post-test was adopted from the cued recall task (Fraser, 1999). It consisted of 20 vocabulary items, 12 of which had been focused upon in the semi-structured interview and 8 of which were never seen before. 1 week after the reading task, a semi-structured interview for vocabulary post-test was conducted to evaluate the effect of instruction on vocabulary learning. Participants were instructed to self-assess their level of knowledge of the word items using a 4-point scale (1 = no familiarity, 2 = recognition but no recall of meaning, 3 = some recall (synonym or translation), 4 = use of the word in a sentence). For items rated as 3 or 4, participants were asked to translate the vocabulary in their mother tongue or English, or use the word to make a sentence in Chinese. Their responses were further coded based on a 2-point scale (0 = incorrect answer, 1 = partially correct answer, 2 = correct answer). The maximum score of this test was 120. To increase the stability of the data, all probes began with two pre-determined questions "What is the meaning of the word?" followed by "Why do you think it means [the meaning of the word] 'x'?".

4.3.6 Radical awareness

The radical identification task was designed to assess students' awareness of semantic radicals. 14 sets of characters, each containing 3 items distinguishable in semantic radicals, were tested. The students were asked to choose, from among 3 characters, the one that best corresponded to the English meaning. One point was awarded for each item and the total score for this task was 14.

4.3.7 Morphological awareness

The morphological identification task involved 12 two-character Chinese word items. Participants were asked to determine whether the first character is semantically related to the second character, that is, whether the two-character word is mono-morphemic or not. One point was given for each correct answer. Participants' knowledge of recognizing morphological structure of a word was evaluated by calculating their

scores in this task.

5. Data analysis

Data gathered from the questionnaires were coded for statistical analysis using PASW 18.0. The Chinese language and literacy proficiency of the NCS students was evaluated by calculating the average scores of the self-rated Chinese attainments in the questionnaire, the reading comprehension task and the vocabulary knowledge test. For the questionnaire on Chinese dictionary use, the frequency of the responses obtained by the students was converted to percentage and reported as an estimate for their awareness and use of Chinese dictionary.

For the analysis of vocabulary learning strategy uses, 21 unknown words along with 12 target words were identified. Initially, frequency distributions based on total word encounters were examined to determine overall patterns of strategy use. A cumulative link model and likelihood ratio tests were used to explore the effects of strategy use, reading comprehension and vocabulary knowledge on literacy proficiency. A correlational analysis was also conducted to examine the relationships between reading comprehension measure, vocabulary knowledge, and frequency distribution of strategy uses.

The students' radical and morphological awareness was evaluated through analysis of the radical and morphological identification tasks. The average scores of each character or word item were reported. Separate Pearson's r tests were carried out to assess the correlation of radical and morphological awareness with vocabulary knowledge and literacy proficiency.

6. Results and Discussion

6.1 Results of the questionnaire

6.1.1 Multilingual proficiencies of the NCS students

The participants were asked to report and self-assess their proficiency levels of Cantonese, English, Mandarin and their L1 in terms of listening, speaking, reading and writing abilities. The assessment was based on a 5-point scale with 5 being the highest, totaling a full mark of 20 for the overall proficiency level of each language (See Table 2). In general, the participants reported higher proficiency in English, followed by their native languages, but lower proficiency in Cantonese and Mandarin Chinese. Results also indicated generally higher levels of competence in listening and speaking than those of reading and writing for all languages.

Table 2 Descriptive statistics for self-rated abilities in language proficiencies

		Min	Max	Mean	SD
Cantonese (with written Chinese) (n=237)	L-S	2	10	6.52	2.13
	R-W	2	10	5.35	1.96
	Total	4	20	11.87	3.49
English (n=236)	L-S	3	10	8.98	1.59
	R-W	2	10	8.46	1.87
	Total	5	20	17.44	3.24

Mandarin (n=207)	L-S	0	9	3.21	1.73
	R-W	0	8	3.17	1.75
	Total	2	17	6.32	3.20
Native Language (n=174)	L-S	2	10	8.69	1.89
	R-W	0	10	5.05	3.00
	Total	3	20	13.57	4.01

Note: n is numbers of valid series deducting incomplete self-report of all four skills. L-S = listening-speaking competence; R-W = reading-writing competence

6.1.2 Chinese dictionary use of the NCS students

The awareness and use of Chinese dictionary was explored in four aspects: dictionary type, usefulness of dictionary, reference skill and instruction of dictionary use.

For dictionary type, we intended to find out the number of dictionaries owned by households, what kinds of dictionary NCS students commonly use and the frequency of consulting a dictionary. Regarding the number of Chinese dictionary that NCS students owned, including both hard and soft copies, 44.3% had one copy, 29.1% had two or three copies and 4.2% had more than three copies, while 22.4% did not own a Chinese dictionary. Dictionaries may be classified in three types according to the medium of publication: printed dictionary, electronic dictionary, and online dictionary. Results illustrated an increasing dependence of students on electronic dictionaries when compared to paper dictionaries. 47.7% of the NCS students used printed version, 21.5% used electronic dictionary and 39.7% used online dictionary. 11.4% of the respondents reported that they did not own a Chinese dictionary at all, or they borrowed a hard copy from the library. A majority of students (79%) could not remember the name of the dictionaries they owned, but among those who could mention, most of their dictionaries were bilingual ones. Only 4 of them were monolingual dictionaries. Among the Chinese dictionaries that NCS students owned, 30.8% of them were chosen by the students, 18.1% were bought by parents, 29.5% were purchased by schools and 27.4% were recommended by teachers. Only 1.7% were distributed by publishers and 5.9 % were given as a gift. 17.3% of the respondents did not own a copy, or they got access to the sources through the internet. This indicated that at least half of the students were influenced by schools and teachers when they come to buy a Chinese dictionary. Concerning the frequency of dictionary use, results of the analyses revealed that the majority of the NCS students did not develop a habit of consulting a Chinese dictionary, even though a large number of them possessed a dictionary. Specifically, only 2.5% used a Chinese dictionary every day, 7.6% two or three times a week and 10.1% once a week, whereas 79.8% seldom or never used a Chinese dictionary.

Linguistic activities can be classified into two categories in terms of reading, writing, listening and speaking skills: 'decoding' activities which require reading and listening skills for comprehension, and 'encoding' activities which involve writing and speaking skills for production (Béjoint, 1981). Results showed that 30% of the NCS students used a Chinese dictionary for reading, 9.3% for listening, 73% for writing, and 25.3% for speaking. This confirmed one of Béjoint's findings that dictionaries were more often used for written

medium than for spoken medium. However, in contrast to Béjoint's findings that dictionary was mainly used for decoding than for encoding, our results suggested a stronger tendency of dictionary use towards encoding. Results of the analyses also revealed that Chinese dictionary use of NCS students was highly instrumentally-motivated. The respondents often used a Chinese dictionary for homework or examination, in particular for writing. This lent support to the extensive use of Chinese dictionary for encoding.

Reference skills, sometimes called reference strategies, refer to the capabilities in retrieving and using information in a dictionary (Cowie, 1999; Zhao, 2004; Hartmann, 2005). Regarding reference skills that NCS students used to consult a Chinese dictionary, 30.8% used stroke number, 28.3% used semantic radical and 24.1% typed in or 'wrote' characters directly in an electronic or web-based dictionary. Only 5.9% used Mandarin Romanized script Pinyin and 4.6% used Cantonese Romanized script JyutPing. According to the way NCS students deal with a variety of meanings within a word or character in a Chinese dictionary, 32.9% looked for the familiar meanings and 25.3% read all the meanings, with 19.4% the first meaning and 16.9% the first few meanings. The interest in familiar meanings supported the finding that dictionary use of NCS students was mainly for writing (productive use), which involved confirmation of the spelling, meaning, etc. of known words and correction of errors.

For instruction of dictionary use, 16.9% did not learn how to use a Chinese dictionary. Of all the students who had learnt the use of dictionaries, 42.6% were briefly taught by the teacher in class, while 15.6% were systematically taught by the teacher, and 15.2% acquired the knowledge through self-learning. 9.7% did not respond to the question. It suggested lesser importance attached to pedagogical effort in promoting the use of dictionaries, in line with Du's (2010) findings.

6.2 Results of the intervention study

6.2.1 Descriptive statistics of all measures

Seven measures were used in this study: (i) Chinese literacy proficiency, (ii) reading comprehension, (iii) vocabulary learning strategies, (iv) Chinese vocabulary knowledge, (v) vocabulary post-test, (vi) radical awareness, and (vii) morphological awareness. Descriptive statistics for all measures is provided in Table 3. After converting the average scores to percentage rates, the average percentage rates of self-rated Chinese literacy proficiency (*48%*), reading comprehension (*31%*), Chinese vocabulary knowledge (*43%*) indicated generally students' low literacy levels in Chinese.

Table 3 Descriptive statistics for all measures

		N	Mean	*SD*	Range
Chinese literacy proficiency	Reading	29	2.34	1.173	1-5
	Writing	29	2.48	1.022	1-5
	Total	29	4.83	1.774	2-9
Reading comprehension		32	3.09	2.844	0-10

Chinese vocabulary knowledge	32	25.91	16.857	3-59
Vocabulary learning strategies	26	9.5	3.952	1-17
Vocabulary post-test	26	38.62	16.425	20-82
Radical awareness	27	9.11	2.873	4-14
Morphological awareness	27	6.89	1.867	3-11

Note: N is numbers of valid series deducting incomplete data.

For the Chinese vocabulary knowledge test, the average accuracy of responses to 49 Chinese vocabulary items in the first learning phrase was 49.3% (773 out of 1568). The students on average could recognize 18.4% of the 8 sampled word items in the second learning phrase (47 out of 256) and 13.5% of the 3 word items that were not found in the lexical lists (13 out of 96).

6.2.2 Vocabulary learning strategy uses

Table 4 presents the total number and frequency of each strategy used by participants.

Our results indicated that the strategy relating morphological knowledge was the most commonly used by the students (38.1%), followed by inferencing using contexts (23.5%), and "radical" and "ignore" comparatively less (13.8%). There are mixed patterns regarding a combination of strategies (being 7.7%), and strategy use other than the above-mentioned ones, such as "phonological" strategy (3.2%). It is to be noticed that no learners consulted a dictionary in the vocabulary learning strategy task, even though it is recommended by many researchers for its contribution to vocabulary learning and reading comprehension (Fraser, 1999; Knight, 1994; Luppescu and Day, 1993).

Results of vocabulary post-test revealed that the overall word retention rate of items having introduced in the reading task was generally low, although the average accuracy score of those items ($M = 27.19$, SD = 13.87) were higher than that of the newly introduced ones ($M = 11.42$, SD = 3.60) (See Table 5 for the average accuracy of response to each item).

Table 4 Number and percentage of strategy types used by the participants

	Frequency	**Percentage**
Morphological knowledge	94	38%
Radical knowledge	34	14%
Contextual guessing	58	23%
Consulting	0	0%
Ignoring	34	14%
Others (e.g. phonological knowledge)	8	3%
Mixed strategies	19	8%
Total	247	100%

Table 5 Average word retention scores of the post-test

Previously introduced items	Average accuracy
歎口氣	2.38
妻子	2.27
分配	2.19
自力更生	2.04
尼龍牀	1.92
沏茶	1.92
罷櫃	1.85
鋁罐	1.85
擠迫	1.77
綜援	1.73
弱勢社羣	1.73
慈善機構	1.69
Newly introduced items	**Average accuracy**
一應俱全	1.50
新晉	1.50
細膩	1.50
首屈一指	1.46
荏苒	1.46
蜿蜒	1.38
昂首挺立	1.31
美輪美奐	1.31

A cumulative link model and likelihood ratio tests were conducted to test whether the frequency distribution of vocabulary learning strategies and vocabulary knowledge contributed significantly to Chinese literacy proficiency. Results of the analyses revealed a positive correlation of students' reading proficiency in Chinese with their vocabulary knowledge (χ^2 (1) = 16.82, p < .001) and the use of morphological knowledge (χ^2 (1) = 3.48, p = .062). Students' vocabulary knowledge also positively correlated with their Chinese literacy proficiency (χ^2 (1) = 8.04, p = .005). On the other hand, a negative correlation between the use of contextual cues and students' writing skills (χ^2 (1) = 4.84, p = .028) was observed. Mixed strategy use also negatively correlated with students' Chinese reading proficiency (χ^2 (1) = 8.42, p = .004) and literacy attainment (χ^2 (1) = 3.91, p = .048).

As Table 6 shows, a correlational analysis was run to explore possible correlation between students' use of learning strategies and the measures for their Chinese vocabulary knowledge and reading comprehension skills. Generally, vocabulary knowledge and reading comprehension skill correlated reasonably highly with each other (.70). There were positive correlations of vocabulary knowledge with strategy uses of

morphological knowledge (.36) and mixed pattern (.32), but negative correlations with strategy uses of radical cues (-.50) and ignoring (-.21). Many of the same factors that correlated with vocabulary knowledge were also associated with reading comprehension skill, including positive correlations of the use of morphological cues (.29) and mixed strategy use (.40), and a negative correlation of inferencing based on radical cues (-.35). For the distribution of strategy uses, guessing from context correlated negatively with inferencing from morphological (-.40) and radical cues (-.31). A positive correlation between mixed strategy use and inferencing from morphological cues was found, while an inverse relationship between mixed strategy use and ignoring (-.26), as well as other inferencing strategy use (-.24), was observed. Other inferencing strategy use also correlated positively with the use of radical knowledge (.26) and ignoring (.36).

Table 6 Correlations between participants' reading comprehension skills, Chinese vocabulary knowledge and use of strategy types

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Reading comprehension		.701	.287	-.348	-.024	.399	.016	-.007
(2) Vocabulary knowledge	.701		.363	-.503	-.026	.321	.031	-.209
(3) Morphological knowledge	.287	.363		-.024	-.402	.432	.025	.089
(4) Radical knowledge	-.348	-.503	-.024		-.314	.146	.256	-.054
(5) Contextual guessing	-.024	-.026	-.402	-.314		-.190	-.093	-.078
(6) Mixed strategies	.399	.321	.432	.146	-.190		-.245	-.264
(7) Others (e.g. phonological knowledge)	.016	.031	.025	.256	-.093	-.245		.360
(8) Ignoring	-.007	-.209	.089	-.054	-.078	-.264	.360	

6.2.3 Radical and morphological awareness

As revealed in Table 3, the resulting average score on the radical identification task was 9.11 out of 14 points, that is, 65 % of radical recognition. The average accuracy of responses in morphological identification task was 57% (6.89 out of 12).

For the students' Chinese radical awareness, Table 7 demonstrated the average correct percentage rates of each item. A relatively poor performance on "to translate", "sleeve", "to pour" was found, in which the relation between these semantic radicals and the meanings of the characters was relatively abstract.

In morphological identification task, 8 items were noun, 2 were verbs and 2 were adjectives. Of all compound nouns, students performed better on NN or VN than NV or AN compounds (See Table 8), which resonated with findings that NN or VN structure is more productive in Chinese than NV structure (Zhang et al., 2012). A lower accuracy of opaque words, such as *maa4 faan4* 'troublesome' and *siu2 saml* 'careful', was observed. It seemed difficult for NCS students to identify morphological structure of opaque words, in which meanings of each character can be combined together to form a coherent concept, but the concept is not the actual meaning of the word (Taft, Liu & Zhu, 1999).

Table 7 Mean correct percentage of character recognition for radical awareness

Item	Mean correct %
Mosquito	85%
To see	81%
Peak	81%
To grill	81%
To jump	78%
Emotion	74%
To bite	63%
To mix	59%
Oak	59%
Sunshine	56%
Pan	56%
Sleeve	48%
To translate	44%
To pour	44%

Table 8 Mean correct percentage of word-relation identification for morphological awareness

Item	Mean correct %
洗碗	85%
書架	81%
飛機	81%
錢包	78%
停課	70%
日記	63%
高山	56%
卡通	44%
麻煩	37%
海報	37%
小心	31%
花生	26%

A separate correlational analysis was conducted to examine the correlation of radical and morphological awareness in connection with Chinese vocabulary knowledge and literacy attainment. A significant correlation between vocabulary size and morphological awareness ($r = .471$, $p < .05$) was found, but not the awareness of semantic radicals ($r = .353$, $p = .071$). No significant correlation between literacy proficiency and morphological awareness ($r = .100$, $p = .618$), as well as radical awareness ($r = .326$, $p = .097$) was found.

6.3 Discussion

6.3.1 Chinese proficiency of the NCS students in Hong Kong

The Chinese language and literacy proficiency levels of the participating NCS students were low, which was consistent with the findings of previous research (for example, Bhowmik & Kennedy, 2016; Ku et al., 2005; Li & Chuk, 2015; Loper, 2004; Wong, 2010; Zhang et al., 2011). The self-estimate of Chinese proficiency of 237 students participating in the questionnaire was relatively low, as compared to proficiency levels of English and their L1. The average percentage rates of reading comprehension and vocabulary knowledge measures revealed a low literacy level in Chinese. Although the students performed better on recognising words in the first learning phrase than those in the second learning phrase and those not included in the lexical lists, they on average could recognize only nearly half of the sampled Chinese words of primary-one-to-three level.

6.3.2 Chinese dictionary use of the NCS students

Results of the questionnaire revealed a decline of consulting dictionaries among the NCS students. Despite the high possession rate, the students seldom or never consulted a dictionary. This is consistent with the observations of previous studies that consulting a dictionary seemed to remain the last resort for learners, despite its positive role of dictionaries in vocabulary learning (Fraser, 1999). Additionally, the use of electronic and online dictionaries became more popular among the NCS students. More than half of the students used electronic and online dictionaries, which outnumbered the use of hard copies. This may be primarily due to easy accessibility of dictionaries on the Internet. Moreover, most of their dictionaries were bilingual ones. We put forth attempt to account for the number of bilingual dictionaries from the following two perspectives. First, bilingual dictionaries which translate words from the first language to the second language provide easy access to vocabulary for productive use (Nation, 2001). This helps serve encoding needs of NCS students. Second, monolingual dictionaries of Chinese to which one can access may not be user-friendly for NCS students. Nation (2001) pointed out that monolingual learners' dictionaries in general contain more information under each word item than bilingual dictionaries do. However, the use of monolingual dictionaries, which are written all in one language, requires L2 learners to be able to interpret definitions and other information in L2. NCS students with low literacy proficiency may therefore experience difficulties in using monolingual dictionaries. Although much research has addressed the importance of using Cantonese Romanization system JyutPing in promoting effective L2 acquisition for NCS students in Hong Kong (Erni & Leung, 2014; Li, 2017; Tse et al., 2007), it seems that L2 learners' dictionaries with JyutPing have not been well developed. Our data on reference skills also reported a low rate of using JyutPing to consult a Chinese dictionary.

6.3.3 Vocabulary learning strategy uses of the NCS students

On the whole, when dealing with unfamiliar vocabulary, the NCS students used strategies that were productive for word learning (i.e., inferencing based on morphological and contextual cues) more frequently

than unproductive ones (i.e., ignoring). Results of the lower ignoring rate resonated with Fraser's (1999) findings that the rate of ignoring new words decreased with instruction. It is striking that, of all strategies used by these learners in the vocabulary learning session, none of them was consulting. That is, apparently no attempt was made to understand meanings of unfamiliar words through consulting a dictionary. This might be partly due to the effect of study environment. The accessibility of dictionary was limited and the learners might avoid consulting a dictionary under an oral interview. In spite of potential effects on the interpretation of data, results of the questionnaire revealing a low frequency of Chinese dictionary use lent support to the view that these learners consult a dictionary sparingly.

Our research shows that the frequency of strategy uses is possibly understood as an important correlate of vocabulary knowledge, reading and writing abilities. Results of the correlational analyses suggested that students who had a higher level of vocabulary knowledge and reading proficiency generally used more morphological cues or multiple strategies while reading, but used radical cues or ignored unfamiliar words less frequently. That is, for those who had a higher level of literacy attainment, they tended to use morphological knowledge or a combination of strategies for vocabulary learning, instead of using radical knowledge or ignoring the word. This is not surprising, because ignoring is seen as an unproductive strategy for word learning, and the use of radical knowledge is more strongly associated with character recognition than with word learning (Wang & McBride, 2016). In light of this, our findings that the NCS students used morphological cues more frequently than radical cues and ignoring suggested that they could make use of relatively productive strategies for vocabulary learning. Nevertheless, previous research on L2 inferencing has indicated that sole reliance on inferences based on word form associations, such as morphological cues, often led to misinterpretation of the word meaning and the text (Bensoussan & Laufer, 1984; Haynes, 1984; Hu & Nassaji, 2014; Huckin & Bloch, 1993). It has been suggested that inferencing based on word forms should be used in association with the contextual cues. However, inferencing from context is not always an easy or efficient strategy for L2 learners to use. Inferencing based on context involves relating a word to a phrase or sentence in which it has occurred, and even the use of various higher order information, such as extratextual and discoursal clues (Huckin & Bloch, 1993). It is thus difficult for learners with a low level of vocabulary knowledge to use such a global word processing successfully, as their vocabulary knowledge may affect the density of unknown words encountered in a text (Nation, 2001). Based on our findings that the NCS students' use of contextual cues was less frequent than that of morphological cues, with a low frequency of using a combination of strategies, we speculate that these students were not experienced strategy users. Most of them were beginners or intermediate learners. Yet, it should be noted that Chinese literacy competence was not evaluated by the accuracy of strategy uses, and therefore it is premature to draw any definite conclusion that these NCS students were non-successful strategy users.

The poor performance of the post-test indicated that the NCS students did not acquire vocabulary well while reading. The average word retention scores of each item having introduced in the reading task were either

slightly higher or lower than 2, meaning that the students in general did not recognize the word or they only recognized the word form but did not recall the meaning. The low retention rates in this study revealed that most students did not go beyond recognition knowledge of unfamiliar words.

6.3.4 Radical and morphological awareness of the NCS students

The performance on radical and morphological awareness indicated that the participating NCS students had fair knowledge of the Chinese orthography. Our results also show that morphological awareness is an important attribute to the explanation of variance in vocabulary knowledge of our NCS students, in line with the findings of earlier studies (e.g., Kuo & Anderson, 2006; McBride, 2016; Wang & McBride, 2016; Tong et al., 2009). The positive correlations of morphological knowledge with vocabulary knowledge, reading comprehension and reading proficiency level also lent support to the view that morphological knowledge appears to play a particularly prominent role in learning of reading in Chinese.

On the other hand, no significant correlation between radical awareness and vocabulary knowledge was found. It is not taken for granted that learners who had a high level of vocabulary knowledge have acquired good radical awareness skills. In the process of character recognition, some NCS students might store characters as whole units without exploring its internal structure.

7. Conclusions and Recommendations

Our project broadens the understanding of NCS students' Chinese dictionary use and vocabulary learning strategy use during incidental reading. Results of students' vocabulary learning strategy use and Chinese dictionary use, as well as pedagogical importance attached to dictionary use accentuated a minimal role of dictionary use in vocabulary learning process. Our findings also provided support for the important role of morphological knowledge in vocabulary knowledge and reading competence. The NCS students in this project had a generally low literacy attainment in Chinese, but had achieved a certain level of radical and morphological knowledge. Many of them were beginners or intermediate learners regarding vocabulary learning strategy uses. Based on the above findings, a number of implications can be drawn. First, research has highlighted positive contributions of consulting to L2 vocabulary learning (An & Yi, 2008; Fraser, 1999; Knight, 1994; Luppescu & Day, 1993). In conformity with the policies on promoting self-learning and self-monitoring of NCS students proposed by the EDB's guidelines, our project suggests a reevaluation of the minimal role of dictionary use in L2 vocabulary learning. At the pedagogical level, teachers could put more efforts in promoting dictionary use by providing precise instructions on how to consult a dictionary in class. Instructions of consulting as an explicit means to strategy use are also needed. Students could be guided to verify inferences based on word form associations and context through consulting for effective determination of word meaning and vocabulary learning. At the level of supporting resources, it can be seen that with the issue of the "Supplementary Guide to the Chinese Language Curriculum for Non-Cinese Speaking (NCS) Students" (Hong Kong Education Bureau, 2008), the government has exerted efforts to

develop a range of L2 curriculum materials and other teaching reference materials with Cantonese Romanization systems to facilitate NCS students' learning of Chinese. However, very few Chinese dictionaries designated for L2 learners such as NCS students, with search of characters using Cantonese Romanization index, were available in the market. The *Chinese-English Dictionary* (Chik & Ng-Lam, 2000) and *English-Cantonese Dictionary* (Kwan et al., 2000) published by The Chinese University Press have provided information about Cantonese Romanization systems, including a comparison between the four different kinds of Cantonese Romanization systems, and Cantonese Romanization index for referencing, but the Cantonese Romanization system they mainly base on is Yale Romanization system. Chinese dictionaries using other standardized and keyboard-friendly Romanization systems, such as JyutPing developed by the Linguistic Society of Hong Kong (LSHK), were absent. Thus, in line with what Li (2017) suggested, along with development of basic curriculum materials based on JyutPing, learners' dictionaries based on JyutPing should also be compiled to facilitate independent learning of NCS students.

Additionally, a pedagogical implication on vocabulary learning strategy is that NCS students will likely benefit from strategy training that focuses on developing awareness of strategy use for learning vocabulary through reading. Results indicated that the participating students, with fair morphological and radical knowledge, were able to use inferencing based on word form associations and context. Analytical teaching methods at character and word levels not only facilitate radical and morphological awareness skills for character and word recognition (Tong et al., 2009), but also the use of inferencing based on word form associations for vocabulary learning. However, the students seldom used a combination of various strategies. More importantly, low word retention rate suggested that they did not know how to use strategies in an appropriate and effective way. The quality of strategy use is a determining factor in successful inferencing (Hu & Nassaji, 2014; Tseng et al., 2006; Zhao et al., 2016). In light of this, we propose strategy training to help students explore different strategies in the reading class. Learners should be encouraged to pay attention to not only what strategies they could use but also how to use them appropriately and effectively. Utilizing radical and morphological knowledge as a platform for further development, teachers could relate radical and morphological awareness skills to inferencing strategy use. Teaching inferencing strategies based on word parts should also be conducted in association with a number of other strategies, such as how to use the context to avoid misinterpretation of a word, and how to consult for verifying guesses from context. Proper use of dictionaries (inferring before consulting) in reading activities is also crucial for successful incidental vocabulary learning in L2. As awareness and use of strategies varied from learner to learner, providing instructions and training are needed on more effective use of lexical processing strategies and practical skills (e.g., how to use a dictionary and when to use it). The strategy training should thus enable NCS students to more fully exploit the rich potential reading for vocabulary learning both inside and outside of classrooms.

Despite a relatively large sample size of the questionnaire, our sample size of the intervention study was small. There were only 32 participants and 12 target words being examined in the intervention study. We

encountered much resistance to the recruitment of NCS students. Nonetheless, our project has provided some insights into an under-researched area of vocabulary learning strategy use and Chinese dictionary use of NCS students in Hong Kong. Future research should be conducted with more participants and more target words.

This project was one of the first to focus on vocabulary learning strategy and Chinese dictionary uses of NCS students in Hong Kong. It helps capture a more comprehensive picture of L2 learners' behaviors of using strategy, which will facilitate effective teaching of Chinese vocabulary learning strategies for the NCS students and eventually prepare the students as independent learners.

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