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An Exploratory Study of the Various Ways that Children Read and Write Unknown Chinese Characters

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Most psychological studies on the learning of Chinese characters assume that children can easily analyze a character into its semantic and phonetic radicals. Rather than this, the present study explores how 17 Grade One to Three children actually went about reading and writing a number of whole characters unknown to them. The major findings are: First, the children indeed were able to make use of the semantic and phonetic radicals to infer the meaning and sound of an unknown character. Second, a major problem of the children is to erroneously use a component other than the semantic radical to make inferences about the meaning of an unknown character. Third, the children on the basis of the sound of the phonetic radical mistook an unknown character as another character homophonous to the sound. Fourth, the children less often made use of their knowledge about the semantic radicals in the task of writing an unknown character than that of reading.

Key words: learning Chinese characters, semantic and phonetic radicals, children's errors

Introduction

The written forms of Chinese characters are not arbitrary symbols. The early-formed simple characters were made to represent the syllable in speech directly using the outward appearance of the things that they stand for. For example, the ancient form of the character 日 "sun" *jat6*  came from the drawing of the sun. Later on, these simple characters were put together to form compound characters. The compound characters, which are now the majority of the characters in use, were meaningfully composed from their components with clear rationales behind, called構意 "the rationale of composing a character" (王寧，2002，pp. 24–33; 王寧、鄒曉麗，1999). For example, the character 婆 "grandma" *po4* [1] was formed by deliberately combining the components 波and 女, where the 波, pronounced as *bo1* on its own, is used to signify the speech sound of 婆 *po4* while the 女, meaning "female", is used to signify the semantic field of "female" to which "grandma" belongs.

To most researchers who are themselves readers of Chinese, it may appear to them very intuitively that the character 婆 should be analyzed into the two components 波 *bo1* and 女 "female". However, children, who have just learned a few hundred characters, may come to understand the characters in a way very much different from that of the researchers. For example, a child may erroneously interpret the character 婆 as related to "water" since the component 氵"water" can also be regarded as one of the components in the character. Thus, investigating how children actually make sense of the components in the characters, as what is meaningful to them, is of particular importance. The purpose of this study is to address this question, which is to find out the various ways that children actually go about reading and writing a list of unknown characters by making use of their knowledge about the semantic and phonetic radicals.

Related Research Studies

An investigation into this question can begin with the linguistic analysis of Chinese characters, which can help us to understand the specific linguistic features of the characters. An overwhelming majority of 90% [2] of Chinese characters fall into the category of semantic-phonetic characters 形聲字(李考定, 1986, pp. 21). These characters are made up of one [3] semantic radical [4]義符 and one phonetic radical 聲符. [5] The semantic radicals provide a clue to the meanings of the characters. For example, 推 "to push" *teoi1*, 拉 "to pull" *laai1*, 抄 "to copy" *caau1*, 指 "to point" *zi2* and 抓 "to grab" *zaau2*, all having the same semantic radical 扌, belong to the same semantic field of "action by hand". The other phonetic radicals provide a clue to the sounds of the characters. For example, all of the characters 伯 "uncle" *baak3*, 怕 "afraid" *paa3*, 拍 "to hit" *paak3* and 帕 "handkerchief" *paak3* have the same phonetic radical 白 *baak6* and their pronunciations are similar. Then the question is: are children indeed aware of these functions of the semantic and phonetic radicals in the characters?

Actually, research on children's awareness of the functions of the semantic and phonetic radicals has over the last decade received much attention. In several psychological studies, children were found to perform better in reading regular characters, for example, 油 "oil" *you2*, in which the sound of its phonetic radical 由 *you2* matches that of the character, than on irregular characters, for example, 抽 "to draw"*chou1* (Ho & Bryant, 1997; Shu, Anderson, & Wu, 2000). This regularity effect was greater on unfamiliar than on familiar characters. The interpretation is that familiar characters could be read directly from rote memory with no need to bother about the phonetic radicals. Greater effect was also found in children at higher than lower grade levels. The Fourth Graders were in transition. This finding also agrees with the characteristics of the characters being taught in the curriculum. Not only are there more semantic-phonetic characters taught in the higher grades, but also more of the characters at higher grades, 45% in Grade Four and only 29% in Grade One, are regular (Wu, Li, & Anderson, 1999).

Children gain an insight into not only the function of the phonetic radicals but also that of the semantic radicals. It was found that children performed better on morphologically transparent words, for example, 銅 "copper" *tung4*, which is clearly a kind of "metal" 金, [6] than on morphologically opaque, for example, 錯[7] "error" *co3* or un-analyzable characters (Shu & Anderson, 1997). Instructional intervention was demonstrated to significantly increase children's reading literacy measures and the performance on the task of choosing among 情 "feeling" *qing4*, 清 "clear" *qing1*, 請 "invite" *qing2* and 青 "green" *qing1* to replace the pinyin in the expression "心 *qing4* 很好 "the feeling is very nice" [8] (Nagy et al., 2002; Wu et al., 2002). For sure, this task has successfully tapped the children's knowledge of what meanings the various semantic radicals suggest. But, an unexamined assumption is that the children can figure out without any problem on their own which of the components in the characters provides a clue to the meanings of the characters, i.e., which one of the components is actually the semantic radical? In the previous task, the four characters 情, 清, 請 and 青 only differ on the left hand side of the characters, thus the children were given the clue that they should look at the component on the left. It can be reasonably argued that, without any guidance on to which component in the characters the children should pay attention, it is doubtful whether the children would still be able to correctly analyze the characters. For instance, the children might reach the incorrect conclusion that the characters were all related to the meaning of "green" since the component on the right 青 means "green" on its own.

As another example, Ho, Yau, & Au (2003) asked children to select from a number of stroke-patterns (comparable to components) to "spell" novel Chinese compound characters. For example, the children chose from 成 *sing4*, 分 *fan1* and 車 *ce1* a component that can be used to form a novel character with the sound of *sing4*. [9] Once again, the task could successfully measure the children's application of the knowledge about the phonetic radicals (i.e., the component 成 can be used to signify the sound of *sing4*). But, what the semantic and phonetic radicals are in the novel characters was pre-determined by the researchers and given to the

children. It cannot be concluded that, in future reading, when the children encounter a novel character with a component 成, they could still figure out that the 成, but not any other components, is the one that provides a clue to the character sound, but also not to the character meaning.

Another line of research comes from 陳莉莉 & 郭婉儀 (2004) and Chan & Nunes (1998, 2001), who investigate kindergarten and primary school children's knowledge about the legal position of a component in the characters, i.e., whether they know that the component 氵always appears on the left hand side of a character? Six-year-olds were found to correctly reject more non-words with components placed in illegal positions such as 豸彩 than those with components in legal positions such as 淶彩. [10] Chan's work has indeed thoroughly examined children's knowledge about the legal location of a component. However, her experiments were all done in the context of children's judging the legality of a character, i.e., whether a character can be accepted as legal or not, but not in the context of making use of the relations between a character and its components. In other words, still the children may not know that the component 木 "tree" provides a clue to the character meaning only when located on the left as in 柏 "cypress", but not when located on the right as in 沐 "bath" *muk6*, where the 木 *muk6* instead serves as a phonetic radical. Thus the question of children's awareness of the significance of the location of a component in a character for determining its function as a semantic radical to the character has still not yet been dealt with.

Therefore, it is worthwhile to ask the following three research questions: (1) Whether have children at the first place acquired general knowledge about the semantic and phonetic radicals for making inferences about the meaning and sound of an unknown character? (2) What are the various ways that children come to figure out how to read and write an unknown character? (3) What are the main difference in the way that children use their knowledge about the semantic radicals between the task of reading and that of writing an unknown character?

Method

Participants

A total of 17 children, 10 boys and 7 girls aged 6 to 9, from Grade One to Three participated in this study (see Table 1 for their backgrounds). They were recruited from three community centers by convenient sampling. During the time of this study, all of the children studied in typical primary schools in Hong Kong, where the children were basically taught Chinese characters in the traditional way. This means that the characters were learned in use in the texts of a textbook and only incidentally, the teachers in the class would attempt to analyze the components in the characters in front of the children. In other words, more innovative practices of teaching the characters as advocated in recent educational reform had not yet been tried out or implemented in the children's schools. Furthermore, the children are mostly from working class families and are all native speakers of Cantonese.

Table 1 Backgrounds of the Children

Child	O	P	M	F	D	L	G	N	A	I	H	C	Q	B	J	K	E
Grade	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3	3	3
Age	6	7	6.5	6	6.5	6.5	6.5	6.5	8	8	7	7.5	9	9	9	9	8
Sex	M	F	F	F	F	F	F	M	M	M	M	M	M	M	M	F	M

Procedure

The study was carried out on an individual basis for each child: (1) The children were first asked to circle from a list of 43 characters (see Table 2) those that are known to them. (2) Then, to make them feel comfortable with the study, the investigator picked out a few characters known to them and asked the children to explain the sounds and the meanings of these characters. (3) After that, the children were asked to write known and then unknown characters. The investigator made sure

that the children understood the meanings of these characters verbally before the children began to write. The children were also strongly encouraged to make guesses when they did not know how to write the characters. (4) Subsequent to this, the children were asked to read unknown characters. The children had to read out the sounds and give explanation of the meanings of the characters. Throughout the whole study, the investigator did not give any feedback on whether or not the children have correctly read or written the unknown characters.

Materials

All of the characters used in this study were taken from the characters listed in the curriculum (香港課程發展議會，1990). The characters were chosen in such a way that the components of the characters are commonly used and can combine with other components to form a large number of characters. In other words, the components of these characters are of high frequency of use and familiar to the children, though the characters as a whole may be unknown to them.

Analysis

The whole process of how each of the children read and wrote the known and unknown characters was audio recorded. On average, it took about 30 minutes for each child to do the study. The analysis of data focused on the children's performance on the unknown characters (see Table 2 for those characters unknown to each of the children), but not the known ones. The reason is that the children's knowledge of the actual meanings and sounds of the known characters would affect their analysis of the known characters. For example, a child may interpret the meaning of the character 橙 "orange" *caang*2 as related to 木 "tree" because the child knows that orange is the fruit of a kind of tree rather than the child recognizes the component 木 in the character 橙 as a semantic radical. The following is a brief account on the findings.

Findings and Discussion

Table 3 (a & b) tabulates the results of the children's reading of the unknown characters. Seven and four different ways of how the children made inferences about the meaning (CM1 to CM7) and sound (CS1 to CS4) respectively of an unknown character have been identified. The numbers of unknown characters that each of the children read in each of the various ways are shown in the table.

CM1 and CS1. In an average of 37.4% ("45+44"/ "119+119" in Table 3a & 3b) of the unknown characters, the children were able to correctly make inferences about the character meanings or sounds through the semantic or phonetic radicals that they know from other characters. For example, a child successfully inferred the sound of the unknown character 淺 "shallow' as *cin*2 by referring to the known character 錢 "money" *cin*2, which shares the same phonetic radical 戔 *zin1* (i.e., CS1). Another child knows that the meaning of the unknown character 狼 "wolf' *long4* has to do with a kind of "animal" since he [11] is aware of other characters about "animal" that share the same semantic radical 犭such as 獅 "lion" *si1* and 狗 "dog" *gau2* (i.e., CM1).

Despite this, as a note, the field record of one of these children clearly shows that there are in fact different levels of understanding the function of the semantic radicals. This child apparently is able to eloquently say as a general principle that characters with the semantic radical 金 "metal" are related to the meaning of "metal". However, when he was asked to give examples to elaborate what he means by this principle, he gave incorrect examples. For example, he said the 錦 of 陳錦安, which is his father's name. But the meaning of the character 錦[12] "tapestry" gam2 actually has nothing to do with "metal". Another example he gave is the character 鏡 "mirror" geng3, which shares the component 金 but modern mirror is unlikely to be made up only of "metal". This shows that even though the children may appear to be able to use their knowledge about the semantic radicals, they may still be confused with those characters in which the semantic radical actually does not provide a clue to the character meaning.

Table 2: The Characters Unknown to Each of the Children

Characters at grade level as listed in the curriculum

			Grade One						Grade Two									Grade Three								Grade Four						Grade Five							Grade Six					
Child*	媽	們	清	晴	婆	怕	沙	狼	灘	筷	梨	淺	獅	箱	波	帕	鈔	暫	箭	聾	籠	灌	薄	碼	駕	殘	鬆	蟹	罐	斧	江	膏	鑼	蠢	掀	柏	焚	嶺	萌	寵	尷	笛	癱	Total
O				√					√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	35
P				√			√	√	√	√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	35
M									√	√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	32
F				√					√			√				√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	30
D								√	√	√		√		√	√	√	√		√	√	√	√	√		√	√	√	√	√	√		√	√	√	√		√	√	√	√	√	√	√	30
L										√		√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√		√	√	√	√	√	√	√	29
G												√					√			√		√	√		√	√		√				√	√	√	√	√	√	√	√	√	√	√	√	20
N										√							√	√		√			√		√	√	√	√	√			√		√	√		√		√	√	√	√	√	19
A				√	√					√				√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	32
I									√	√		√				√	√	√	√	√	√	√		√	√	√		√	√	√		√	√	√	√	√	√	√	√	√	√		√	27
H																				√						√									√	√	√		√				√	7
C																						√	√										√	√	√		√						√	7
Q									√	√				√		√	√	√	√	√		√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	28
B										√							√	√	√	√	√	√					√	√		√			√	√	√	√	√	√	√	√	√	√	√	21
J												√				√	√	√		√		√	√	√	√	√							√	√	√		√	√	√	√	√		√	19
K																√	√					√				√				√				√	√	√	√	√	√	√	√		√	14
E																				√													√	√	√	√	√		√	√	√	√		10

* The alphabetical order of the codes of the children indicates their order in doing the experiment.

Table 3a: The Number of Unknown Characters that Each Child Attempted to Read (Their Meanings) in Each of the Different Ways

	Child																
	O	P	M	F	D	L	G	N*	A	I	H	C	Q	B	J	K	E*	Total
The total number of unknown characters that a child attempted to read	11	4	10	3	3	14	10		9	6	5	5	13	8	10	8		119
<u>The number of the unknown characters that a child attempted to read their meanings in each of the following ways</u>																		
CM1**. The child made use of the semantic radical to infer the character meaning and came up with the semantic field or the correct meaning of the character, e.g., reading 銅 "copper" *tung4* as related to "metal" (金 "metal").	1	0	4	1	1	6	6		1	3	3	3	3	4	6	3		45
CM2. The child made use of the semantic radical to infer the character meaning but came up with an incorrect meaning associated with the semantic radical, e.g., reading 錯 "error" *co3* as related to "metal' (金 "metal").	0	0	0	0	0	1	1		1	2	0	0	0	0	1	0		6
CM3. The child made use of the meaning of the phonetic radical to infer the character meaning and came up with an incorrect meaning associated with the phonetic radical, e.g., reading 銅 "copper" *tung4* as related to "sameness" (同"same" *tung4*).	2	0	1	0	0	3	0		2	1	1	0	1	1	1	1		14

CM4. The child made use of the sound of the phonetic radical to infer the character meaning and came up with an incorrect meaning associated with another character homophonous to the sound of the phonetic radical, e.g., reading 銅 "copper" *tung4* as related to "children" (同 *tung4* and 童 *tung4* "children").	1	0	1	0	0	0	0	0	0	0	0	2	1	2	2	9
CM5. The child made use of a component other than the semantic or phonetic radicals to infer the character meaning and came up with an incorrect meaning associated with the component, e.g., reading 銅 "copper" *tung4* as related to "mouth" (口 "mouth").	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	3
CM6. The child did not make use of any of the components to infer the character meaning and came up with an incorrect meaning not associated with any of the components, e.g., reading 銅 "copper" as related to "tree".	0	0	0	0	0	1	0	3	0	0	0	1	0	0	0	5
CM7. The child did not make use of any of the components to infer the character meaning and came up with no meaning.	7	4	4	2	2	3	3	1	0	1	2	5	1	0	2	37

* The tapes of two children are inaudible due to administrative problems.

** CM stands for "character meaning".

Table 3b: The Number of Unknown Characters that Each Child Attempted to Read (Their Sounds) in Each of the Different Ways

	Child																
	O	P	M	F	D	L	G	N*	A	I	H	C	Q	B	J	K	E*	Total
The number of the unknown characters that a child attempted to read their sounds in each of the following ways																		
CS1. The child made use of the phonetic radical to infer the character sound and came up with the correct sound of the character, e.g., pronouncing 清"clear" *cing1* as *cing1* (青 *cing1*).	2	0	4	2	1	4	4		2	3	1	3	4	5	5	4		44
CS2. The child made use of the phonetic radical to infer the character sound but came up withan incorrect sound associated with the phonetic radical, e.g., pronouncing 倩 "beautiful" *sin3* as *cing1* (青 *cing1*).	3	0	1	0	0	0	4		2	3	1	2	4	1	5	2		28
CS3. The child did not make use of any of the components to infer the character sound and came up an incorrect sound not associated with any of the components, e.g., pronouncing 清"clear" *cing1* as *muk6*.	0	0	0	0	0	1	1		5	0	1	0	4	2	0	2		16
CS4. The child did not make use of any of the components to infer the character sound and came up with no sound.	6	4	5	1	2	9	1		0	0	2	0	1	0	0	0		31

* The tapes of two children are inaudible due to administrative problems.

** CS stands for "character sound".

CM2 and CS2. One type of the children's errors found in this study lies in the over-use of knowledge about the semantic or phonetic radical in a character where the semantic or phonetic radical actually does not provide a correct clue. This happened in the children's reading of 14.3% ("6+28/119+119") of the unknown characters on average. For example, a child pronounced the character 鈔 *caau1* of 鈔票 "dollar bill" as *saa1*, which is the sound of the commonly used character 沙 "sand' *saa1* that share the same phonetic radical 少 *siu*2 (i.e., CS2). Another child interpreted the meaning of the unknown character 蟹 "crab" *haai5* as related to "ant" or "cockroach", perhaps because the semantic radical 虫 in the 蟹 signifies a meaning of "insect" on its own (i.e., CM2).

It should be noted that, in these cases, the children had successfully acquired general knowledge about the semantic and phonetic radicals but were only unaware of the extent to which such general knowledge can be applied. It can be seen that the characters here are mostly irregular characters, in which, due to historical changes, the relation between the meaning or sound of the character and that of its semantic or phonetic radical has become opaque. For example, the character 虫 historically referred to "poisonous snake" as indicated by its written form, but now just can be used to mean "insect".

CM3. Another common error of the children is to use the phonetic radical to make inferences about the meaning of an unknown character. This was found in the children's reading of 11.8% (14/119) of the unknown characters on average. For example, a child interpreted the meaning of the unknown character 箭 "arrow"*zin3* as related to "position" or 前後左右 "front, rear, left and right", probably because of the phonetic radical 前 *cin4*, which means "front". As another example, the unknown character 嶺 "a mountain range" *ling5* was interpreted by a child as to mean "leading (領 "to lead" *ling5*) a group of people to the hill (山 "hill" *saan1*). "

CM4. Another kind of error occurs in the reading of 7.6% (9/119) of the unknown characters on average when the children made use of only the sound of the phonetic radical to erroneously determine the character meaning as that of another character homophonous to the sound. For example, a child incorrectly interpreted the meaning of the unknown character 癱 "paralysis" *taan1* as "to bar". Perhaps, from the sound of

the phonetic radical 難 *naan4*, the child mistook the character 癱 as another character 欄 "to bar" *naan4*, which shares the same sound as the phonetic radical 難 *naan4*. Another example is of another child who incorrectly interpreted the meaning of the unknown character 柏 "cypress" *paak3* as "to hit". He explained that the unknown character 柏 was the character 拍 "to hit" *paak3* of the word 拍蚊 "to hit a mosquito".

CM5. The children also erroneously identified a component other than the semantic or phonetic radical as a clue to the character meaning or sound. This happened in their reading of 2.5% (3/119) of the unknown characters on average. For example, a child incorrectly explained that the unknown character 駕 "to drive" *gaa3* meant "dumb" because there is the component 口 "mouth" in the character. As another example, the sound of the unknown character 蟹 "crab" *haai5* was erroneously interpreted by a child as that of 角 *gok3*. A third example is of a child who was asked to give examples of a character that has the component 木 "tree" serving as a semantic radical. He named the incorrect character 條 "a long piece" *tiu4*. In all of these three cases, the components 口, 角 and 木 serve neither as a semantic nor phonetic radical.

CM6, CM7, CS3 and CS4. In the rest of the cases, i.e., 37.4% ("5+37+16+31"/ "119+119") of the unknown characters, the children either did not make any guess or came up with a meaning or sound that is totally unrelated to any of the components. For example, a child had completely no idea of the sound of the unknown character 駕 "to drive" *gaa3* (i.e., CS4). Another child incorrectly interpreted the meaning of the unknown character 暫 "temporary" *zaam6* as the 知 "to know" *zi1* of the word 知識 "knowledge", which actually has nothing to do with any of the components in the character 暫, i.e., 車 "car" *ce1*, 斤 "catty" *gan1*, 日 "the sun" *jat6* and 斬 "to chop" *zaam2* (i.e., CM6).

The above discusses the situation where the children attempted to read an unknown character, i.e., how do the children infer the meaning and sound of an unknown character from its written form? In what follows, we will examine the reverse situation where the children attempted to write an unknown character, i.e., how do the children determine the written form from the meaning and sound of an unknown character?

In Table 4, the results of the children's writing of the unknown characters are tabulated. We have identified five and three different ways that the children came to produce the semantic (SR1 to SR5) and phonetic radicals (PR1 to PR3) respectively of an unknown character. The table shows the numbers of unknown characters that each of the children attempted to write in each of the various ways.

SR1 and PR1. On average, in 41.8% ("28+59"/ "104+104" in Table 4) of the unknown characters, the children made use of the character meaning or sound to determine the correct semantic or phonetic radical. For example, when a child was asked to write the character 鑼 *lo4* of 銅鑼 "brass gong", he mentioned that he had never learned such a character before and that he just gave it a try. Then he wrote the character 鑼, where both of the semantic radical 金 "metal" and phonetic radical 羅 *lo4* are correct (i.e., SR1 and PR1). Another example, which can further illustrate the process of how the children came up with the written form, is the attempt of a child to write the character 柏 *paak3* of 柏樹 "cypress". Based on the character sound *paak3*, he started to write the phonetic radical 白 *lo4* first, and then, while talking to himself that 柏樹 "cypress" is a kind of tree, he added the semantic radical 木 "tree" to the left of the 白, thus correctly produced the character 柏 (i.e., SR1 and PR1).

It is noteworthy that this way of writing the characters, i.e., from the phonetic radical on the right followed by the semantic radical on the left, in fact violates the correct writing sequencing of the components in the characters, which as a rule always goes from the left to the right. However, as recorded in the field note, at least 8 out of the 15 children have shown evidence of writing at least one of the unknown characters in such a way. This perhaps demonstrates the crucial importance of the character sound at the beginning of the process of figuring out the written form of an unknown character.

SR2. In an average of 2.9% (3/104) of the unknown characters, the children did make use of the character meaning to determine the semantic radical but they still made certain reasonable errors. For example, a child wrote the character 癱 *taan2* of 癱瘓 "paralysis" as 蹣. He explained that his understanding of the meaning of *taan2* (癱) was "broken leg". This exactly agrees with the incorrect semantic radical 疋,

which signifies the meaning of “leg”. As another example, a child wrote the 聾 *lung4* of 耳聾 “deaf” as 隴, probably because he was confused by the name of the semantic radical 阝耳仔邊 “the ear component”, which was named after its appearance like an ear. However, the meaning that it signifies, i.e., “a mound”, has nothing to do with “ear”.

This brings up a problem in teaching that calling a semantic radical by its appearance sometime confuses children about the difference between its name and the meaning that it signifies. This is similar to the case where English-speaking children incorrectly mix up letter name such as *ar* of the letter “r” with the sound that the letter signifies, i.e., *r*. The children in this case may spell “car” *kar* as “cr”, using the “r” to represent the entire *ar* sound (Cassar & Treiman, 2004; Treiman, 1993).

SR3. A common children’s error in writing the semantic radicals is to produce an incorrect semantic radical that is related to another character homophonous to the character sound. This was found in the children’s writing of 18.3% (19/104) of the unknown characters. One example is of a child who produced the character 鈔 *caau1* of 鈔票 “dollar bill” as 抄, which is actually another character with the same sound *caau1* but having the meaning of “to copy” instead of “dollar bill”. As another example, a child was asked to write the character 柏 *paak3* of 柏樹 “cypress”. The investigator has repeatedly hinted that “cypress” is a kind of tree. Still the child erroneously produced the character as another character 帕 “handkerchief” *paak3* and did not bother to check whether the semantic radical 巾 “clothing” agrees with the meaning of “cypress”.

As a further note, none of the children were found in this study to make similar error in writing the phonetic radical, i.e., making use of the character sound to come up with an incorrect phonetic radical homophonous to the sound, for example, writing the phonetic radical of the character 聾 “deaf” *lung4* as 隆 *lung4*. This is in principle possible but perhaps the phonetic radicals of the characters used in this study are too familiar to the children that they could easily come up with the correct ones.

SR4, SR5, PR2 and PR3. In the rest of the cases, i.e., 47.6% (“6+48+8+37”/ “104+104”) of the unknown characters on average, the

children either did not write the semantic or phonetic radical or wrote an incorrect one that is in no way related to the character meaning or sound. For example, when a child was asked to write the unknown character 鑼 *lo4* of 銅鑼 "brass gong", he erroneously wrote the character as 纙, which is not a character and its semantic radical 糸 "silk" has nothing to do with the meaning of "brass gong" (i.e., SR4). As another example, a child incorrectly wrote the unknown character 薄 *bok6* of the word 厚薄 "thickness" as 溥. He did realize that there should be something on top of the character but he did not know what it was (i.e., SR5).

Comparing reading and writing. Taken together both of the results of the children's reading and writing of the unknown characters, a clear difference is obtained in how the children made use of their knowledge about the semantic radicals between the task of reading and that of writing. As shown in Table 3, in 42.9% ("45+6"/119) of the unknown characters, there was evidence that the children made use of their knowledge about the semantic radicals in reading (i.e., CM1 and CM2). In contrast to this, in writing, there was evidence in only 29.8% ("28+3"/104) of the unknown characters, much less than that of reading, that the same group of children used their knowledge about the semantic radicals to write the semantic radical (i.e., SR1 and SR2 in Table 4). In other words, although the children understood quite well what clues that the semantic radicals provide to the character meanings, as shown in the task of reading, interestingly they were less well in applying this knowledge to the task of writing.

Perhaps, in the task of reading, the children were given the written form of an unknown character such that they would quite likely look into each of the semantic and phonetic radicals one by one. In contrast, the situation is reversed in writing, where the children had to start from scratch to come up with the entire written form such that it might be difficult for them to pay great attention to the details of the written form. The task of reading thus requires something of the children very much different from that of writing. We definitely cannot simply take for granted that the children could apply what they know in reading to writing.

Table 4: The Number of Unknown Characters that Each of the Children Attempted to Write in Each of the Different Ways

	Child																
	O	P	M	F	D	L	G	N	A*	I	H	C	Q	B*	J	K	E	Total
The total number of unknown characters that a child attempted to write	8	7	8	8	7	10	5	5		7	3	7	11		7	7	4	104
The number of the unknown characters that a child attempted to write their semantic radicals in each of the following ways																		
SR1**. The child made use of the character meaning to infer the semantic radical and came up with the correct semantic radical, e.g., writing the semantic radical of 聾 "deaf' *lung4* as 耳 (耳 "ear').	1	0	1	3	0	2	2	2		4	2	2	1		3	3	2	28
SR2. The child made use of the character meaning to infer the semantic radical but came up with an incorrect semantic radical associated with the character meaning, e.g., writing the semantic radical of 聾 "deaf' *lung4* as 阝(阝 "mound' with the name of 耳仔邊 "the ear component').	0	1	0	0	0	0	0	1		0	0	0	0		0	0	1	3
SR3. The child made use of the character sound to infer the semantic radical and came up with an incorrect semantic radical associated with another character homophonous to the character sound, e.g., writing the semantic radical of 聾 "deaf' *lung4* as 竹 (籠 "cage' *lung4* and 竹 "bamboo').	1	1	2	2	1	1	0	0		2	0	2	4		1	1	1	19

SR4. The child did not make use of the character meaning to infer the semantic radical and came up with an incorrect semantic radical not associated with the character meaning, e.g., writing the semantic radical of 聾 "deaf' *lung4* as 木 (木 "tree').	0	0	0	1	0	1	2	1	0	0	0	0	1	0	0	6
SR5. The child did not make use of the character meaning to infer the semantic radical and came up with no semantic radical.	6	5	5	2	6	6	1	1	1	1	3	6	2	3	0	48
<u>The number of the unknown characters that a child attempted to write their phonetic radicals in each of the following ways</u>																
PR1. The child made use of the character sound to infer the phonetic radical and came up with the correct phonetic radical, e.g. writing the phonetic radical of 聾 "deaf' *lung4* as 龍 (龍 *lung4*).	2	1	3	6	1	3	3	3	6	2	5	7	6	7	4	59
PR2. The child did not make use of the character sound to infer the phonetic radical and came up with an incorrect phonetic radical not associated with the character sound, e.g., writing the phonetic radical of 聾 "deaf' *lung4* as 木 (木 *muk6*).	0	1	0	0	0	1	1	1	0	0	2	1	1	0	0	8
PR3. The child did not make use of the character sound to infer the phonetic radical and came up with no phonetic radical.	6	5	5	2	6	6	1	1	1	1	0	3	0	0	0	37

* The data of two children are missing due to administrative problems.

** SR and PR stand for "semantic radical" and "phonetic radical" respectively.

Implications and Conclusion

We have thus far explored and given an account of the different ways that the children came to read and write a list of characters unknown to them. In what follows, I will deal with the three research questions set forth at the beginning of this paper.

First, whether have children at the first place acquired general knowledge about the semantic and phonetic radicals? This study clearly shows that the children were able to make use of the semantic and phonetic radicals to make inferences about the meaning and sound of an unknown character. This result converges with the findings of many other studies such as Shu & Anderson (1997), Shu et al. (2000), Ho & Bryant (1997), etc, in which it was demonstrated that, instead of learning the characters in isolation, children also gain general knowledge about the semantic and phonetic radicals common to all characters.

Second, what are the various ways that children come to figure out how to read and write an unknown character? The major error of the children found in this study lies in using a component other than the semantic radical to infer the character meaning. The implication of this is that simply teaching children the relations between the semantic radicals and what meanings they signify does not seem to be enough. For example, it is not sufficient just to teach children that characters with the semantic radical 木 "tree" belong to the semantic field of "tree". Further to this, the children also need to be able to analyze which one of the components in an unknown character is, and more importantly is not, the semantic radical. For example, the component 木 "tree" provides a clue to the meaning of the character 榕 "banyan" *jung4* but the same 木 in the characters 沐 "bath" *muk6*, 想 "to think" *soeng2*, 霜 "frost" *soeng1* and 蜥 "lizard" *sik1* does not provide such a clue.

Third, what are the main difference in the way that children use their knowledge about the semantic radicals between the task of reading and that of writing an unknown character? This study shows that the children less often used their knowledge about the semantic radicals in writing than in reading. The interpretation of this is that the tasks of reading and writing are very much different to the children. Perhaps

reading is the context in which the children were previously taught to analyze the characters into semantic and phonetic radicals. As such, the children might not be able to transfer this knowledge to another new context, i.e., writing. Thus not only should children be taught how to use the semantic radicals in reading the characters, we should also help children to become more sensitive to whether the semantic radical they wrote is in agreement with the character meaning.

Above all, this study interestingly reveals the different ways that children experienced in reading and writing a list of unknown characters. To the best of my knowledge, this so far has been left unexamined in most other research studies reported in the literature, where children were far too often assumed without question to be able to analyze a character such as 媽 "mother" *maa1* correctly into its semantic 女 "female" and phonetic radicals 馬 *maa5*. However, it is definitely possible that children may erroneously combine both of the meanings of the components 女 "female" and 馬 "horse" together to arrive at an incorrect character meaning of "a female horse". Thus the question about the actual process of how children come to read and write the characters, putting aside strict pre-assumption of what strategies they use, definitely deserves more of the attention of research.[13]

As a final word of caution, only a small number of children were involved in this study. We certainly cannot make generalization about children as a population. But surely the findings of this study can serve as a very valuable basis for formulating other further research studies.

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Notes

1. In this paper, most of the sounds of the characters are in Cantonese and are transcribed using the Romanization developed by the Linguistic Society of Hong Kong. Only for those characters used in studies conducted in Putonghua, Hanyu Pinyin is used.
2. However, many of the most frequently used characters are not semantic-phonetic characters. As 高景成 (1988) points out, in the top 50 most frequently used characters, only 9 of them are semantic-phonetic characters, i.e., of only 18%. But if we take into account all of the characters, the vast majority of the characters are semantic-phonetic characters.
3. Several Chinese linguists (邱德修，1995，頁 253–256；唐蘭，1949，頁 107–108；高明，1996，頁 53–54；裘錫圭，1993，頁 177–181) have strongly argued against the analysis of some semantic-phonetic characters as having more than one semantic or phonetic radicals. For example, the character 寶 *bou2* "treasure" should not be analyzed as consisting of three semantic radicals 宀 "house", 玉 "jade" and 貝 "sea shell" and one phonetic radical 缶 *fau2* (i.e., 三形一聲 in Chinese) because the rarely known character 窴, which is made up of the three components 宀, 玉 and 貝, was once found in some ancient texts and this character as one should instead form the semantic radical in the character 寶.
4. In this paper, the term "radical" refers to a component that constitutes either the meaning or sound of the whole character, for example, the semantic radical 女 "female" or the phonetic radical 波 *bo1* in the character 婆 "grandma" *po4*. In contrast, the term "component" is more loosely used to refer to any part of a character, for example, the component 皮 or the component 波 in the character 婆.
5. There is no consistent way to describe these linguistic units of Chinese characters in English. Semantic-phonetic characters are also given the names of picto-phonetic characters, phonetic compounds, phonograms, phono-semantic compounds and many others. Some researchers refer semantic radicals to as semantic components, morphological components or simply radicals while phonetic radicals are also called phonetic components or in short phonetics.
6. The character 金 *gam1* is now more commonly used to mean "gold" or "money". But in the ancient time, the meaning of the character 金 was actually "bronze" and more broadly referred to "metal".
7. The character 錯 *co3* in ancient time referred to "the crossings on the surface of metal" as in 交錯 "crossings". But the character is now more frequently used to mean "error".
8. The answer is the character 情.
9. The answer is the component 成.

10. These characters are just made up for experimental use and are not real Chinese characters.
11. For the sake of simplicity, the word "he" refers to both male and female throughout this paper.
12. As a rare case, the component 金 *gam1* on the left actually serves as a phonetic radical in the character 錦 *gam2*.
13. In fact, this line of work has been further taken up and thoroughly investigated in the main study of Lam (2006), in which a phenomenographic approach is used to investigate the children's learning of Chinese characters.

References

Cassar M. & Treiman, R. (2004). Developmental variations in spelling: Comparing typical and poor spellers. In C. A. Stone, E. R. Silliman, B. J. Ehren, & K. Apel (Eds.), *Handbook of language and literacy—Development and disorders* (pp. 627–643). New York: The Guilford Press.

Chan, L. & Nunes, T. (1998). Children's understanding of the formal and functional characteristics of written Chinese. *Applied Psycholinguistics*, *19*, 115–131.

Chan, L., & Nunes T. (2001). Explicit teaching and implicit learning of Chinese characters. In L. Tolchinsky (Ed.), *Developmental aspects in learning to write* (pp. 33–53). Dordrecht, Netherlands: Kluwer Academic.

Ho, C. S. H., & Bryant, P. (1997). Learning to read Chinese beyond the logographic phase. *Reading Research Quarterly, 32*(3), 276–289.

Ho, C. S. H., Yau, P. W. Y., & Au, A. (2003). Development of orthographic knowledge and its relationship with reading and spelling among Chinese kindergarten and primary school children. In C. McBride-Chang & H. C. Chen (Eds.), *Reading development in Chinese children* (pp. 51–71). Westport, CT: Greenwood Publishing Group.

Lam, H. C. (2006). *Orthographic awareness in learning Chinese characters*. Unpublished doctoral dissertation, Faculty of Education, The University of Hong Kong.

Nagy, W. E., Kuo-Kealoha, A., Wu, X., Li, W., Anderson, R. C., & Chen, X. (2002). The role of morphological awareness in learning to read Chinese. In W. Li, J. S. Gaffney, & J. L. Packard (Eds.), *Chinese children's reading acquisition: Theoretical and pedagogical issues* (pp. 59–86), Boston: Kluwer Academic.

Shu, H., & Anderson, R. C. (1997). Role of radical awareness in the character and word acquisition of Chinese children. *Reading Research Quarterly*, *32*(1), 78–89.

Shu, H., Anderson, R. C., & Wu, N. (2000). Phonetic awareness: Knowledge of orthography-phonology relationships in the character acquisition of Chinese children. *Journal of Educational Psychology, 92*(1), 56–62.

Treiman, R. (1993). *Beginning to spell: A study of first grade children*. New York: Oxford University Press.

Wu, X, Anderson, R. C., Li, W., Chen, X., & Meng, X. (2002). Morphological instruction and teacher training. In W. Li, J. S. Gaffney, & J. L. Packard (Eds.), *Chinese children's reading acquisition: Theoretical and pedagogical issues* (pp. 157–173). Boston: Kluwer Academic.

Wu, X., Li, W., & Anderson, R. C. (1999). Reading instruction in China. *Journal of Curriculum Studies, 31*(5), 571–586.

王寧（2002）。《漢字構形學講座》。上海：上海教育出版社。

王寧、鄒曉麗（主編）（1999）。《漢字》。香港：和平圖書海峰出版社。

李考定（1986）。《漢字的起源與演變論叢》。台北：聯經出版社。

邱德修（1995）。《文字學新撢》。台北：合記圖書出版社。

香港課程發展議會（1990）。〈分級常用字表〉。載香港課程發展議會（編訂），《中國語文科：小一至小六課程綱要》（頁 69–76)）。香港：政府印務局。

唐蘭（1949）。《中國文字學》。香港：太平書局。

高明（1996）。《中國古文字學通論》。北京：北京大學出版社。

高景成（1988）。〈略談形聲字的難點和其他〉。載語言文字應用研究所（編），《漢字問題學術討論會論文集》（頁 100–107）。北京：語文出版社。

陳莉莉、郭婉儀（2004）。〈學前兒童對中文字形結構的認識〉。《基礎教育學報》，第 13 卷第 2 期，頁 23–38。

裘錫圭（1993）。《文字學概要》。台北：萬卷樓圖書。

初探兒童認讀與書寫陌生漢字字形的各種方法

林浩昌

摘 要

有關學習漢字的心理研究，一般都預設：兒童很容易就能夠把一個漢字拆分爲義符與聲符。本研究摒除這樣的預設，以十七名小一至小三兒童爲對象，探討他們究竟怎樣認讀與書寫陌生的完整字形。結果發現：一、兒童確實能夠運用字形中包含的部件，來猜測字義與字音。二、兒童分析字形的困難，其實是誤用並非義符的部件來推測字義。三、兒童也會誤以聲符的讀音，錯認字形爲另一同音字。四、當兒童書寫字形時，亦較少運用自己已有對義符的知識。

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