

Radical Awareness and Chinese Character Recognition in Chinese as a Heritage Language: Comparison between Two Textbooks

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Abstract: The purpose of this study is to understand the role of radical awareness in Chinese as a Heritage Language (CHL) Learners' character recognition. In addition, this study also compared the character learning pedagogies in two different textbooks. The Textbook 2 group (Immediate Character Introduction) who had the opportunity to learn the radicals earlier than the Textbook 1 group (Delayed Character Introduction) established radical awareness at an earlier stage and as a result performed better in character writing. Radical awareness has been proved to have a mediation effect between the type of textbook and character writing. These findings provide important implications for selecting CHL textbook and designing CHL coursework. Specifically, it is crucial for CHL instructors to consider the timing of introducing radicals and establishing radical awareness to assist character recognition.

Keywords: Chinese as a Heritage Language, Delayed character introduction, Immediate character introduction, Chinese character writing, Radical awareness.

1. Introduction

Chinese immigrants are one of the largest foreign-born groups in the United States. The population has grown rapidly since 1960 (about 0.1 million), reaching approximately 1 million in 2000 (U.S. Census Bureau, 2006). The estimate of Chinese immigrant population was 3.96 million in 2016, representing 1.2% of the approximately 318 million total U.S. population (U.S. Census Bureau, 2016). Chinese heritage language schools are popular among Chinese immigrant communities for Chinese ethnic language maintenance around the world. In the United States, Chinese heritage language schools dated back to the late 1880s and served to preserve the Chinese language and cultural heritage in the second and succeeding generations (Zhou & Li, 2008). More than 70% of Chinese learners in the U.S. are attending Chinese heritage language schools (McGinnis, 2005).

Despite the rapid development these years, Chinese heritage language schools are still facing some challenges. Currently the lack of an accreditation system for heritage language schools classifies them as an extra-curricular activity and as a result, separates them from the formal public schools (Hsu, 2012; Seo, 2017). The quality of heritage language teachers has a great influence on Chinese as a heritage language (CHL) learners' learning outcomes (Curd-Christian, 2006). The selection of textbook and the teacher's pedagogy according to the textbook also make differences in CHL learners' learning experiences (Law, 2015; Wu, 2007).

2. Literature Review

2.1. Radical Awareness in Chinese

Radical awareness refers to "the functional understanding of the role of radicals in forming Chinese characters and the ability to use this knowledge consciously in learning characters" (Shen & Ke, 2007, p.100). Radical awareness played an important role in native Chinese speakers' character

acquisition (Shu & Anderson, 1997; Tong et al., 2017; Wang et al., 2015; Yin & McBride, 2015). Chinese elementary students who were native Chinese learners were able to use the knowledge of familiar radicals to infer the meanings of new characters (Shu & Anderson, 1997). Students in higher grade levels tended to use this radical strategy more commonly (Tong et al., 2017). The sensitivity to locate the radical in a character and understand the role of this radical contributes uniquely to word reading and writing (Wang et al., 2015; Yin & McBride, 2015).

2.2. Factors and Relationships in Chinese Character Acquisition

Chinese character learning is a complex process which involves many factors such as cognitive skills, language skills, and metalinguistic awareness. Researchers have focused on the relationships between these factors for native Chinese speakers (Liu et al., 2017; Yang et al., 2019; Zhang, 2014). Basic language skills mediated the effects of basic cognitive skills on character reading (Yang et al., 2019). Radical awareness and lexical inference ability made significant contributions to vocabulary reading. Further, there is a partial mediation of lexical inference ability in the contribution of radical awareness to vocabulary reading (Zhang, 2014). Significant partial mediating effects of semantic radical function knowledge and vocabulary skills are also found in the association between morphological awareness and character reading (Liu et al., 2017). For young Chinese as a second language (CSL) learners, radical awareness is found to have both direct and indirect influences via the mediation of character reading and copying on character writing (Wong & Zhou, 2022). Previous findings have revealed the importance and mediation effect of radical awareness in character reading and writing for native Chinese speakers and CSL learners. Limited research has been conducted on CHL learners who have different language background from native Chinese speakers and CSL learners to understand the mediation of radical awareness in Chinese character learning.

Thus, the present study aims to fill this gap by providing more empirical evidence based on a mediation model of radical awareness in character writing for CHL learners.

2.3. The Present Study

The purpose of the present study is to investigate the different pedagogical approaches in the two textbooks on Chinese character acquisition for CHL beginning learners. It further extends to examine the mediation effect through radical awareness between the type of textbook and character writing. Two specific research questions are proposed below:

1. Are there any differences in radical awareness and character writing between two groups of CHL beginning learners who learn Chinese using two different types of textbooks?

2. How does radical awareness mediate between the type of textbook and character writing when controlling for learners' grade level?

3. Method

3.1. Research Context and Participants

The current study was conducted in a local Chinese heritage school in Texas. It is one of the largest Chinese heritage language schools in Texas. Chinese language courses are typically offered to children at weekends. The students are mostly from Chinese-speaking families and learn Chinese as a heritage language (CHL). The participants were recruited from 1st grade to 4th grade CHL learners in the Chinese school. The total sample size was 104 including 20 students in 1st grade, 35 students in 2nd grade, 17 students in 3rd grade, and 32 students in 4th grade.

3.2. Curriculum

Textbook 1 - Delayed Character Introduction (DCI)

The curriculum in the Chinese school were designed based on two types of textbooks. In this study, CHL beginning learners' radical awareness and Chinese character recognition were compared between the students who learned two different textbooks. Textbook 1 (中国暨南大学华文学院, 2016) composed by experts from Jinan University in China follows the DCI pedagogy that characters should be introduced after a time lag from the course starts and begins with pinyin. All the new characters and texts are marked with pinyin as a scaffold for Chinese reading. Stroke orders are the emphasis in character writing in Volume 1. The stroke orders of each new character are presented clearly step by step for students to follow. Radicals are labeled after new characters starting from Volume 2, but the meaning clues of the radicals are not provided. For example, after the new character list, three characters are labeled with their corresponding radicals such as 拾 (shí, pick up) with 扌 (shǒu, hand), 房 (fáng, house) with 户 (hù, home), and 饿 (è, hungry) with 饣 (shí, eat). The form of radical practice in Textbook 1 is to ask students to write characters with the given radicals. For instance, the following practice first provides a model that by giving the radical 亻 (rén, person), two characters with the radical 亻 are listed - 你 (nǐ, you) and 他 (tā, him). The students are then asked to come up with two characters for each given radical such as 艹 (cǎo, grass), 氵 (shuǐ, water), 木 (mù, wood), etc.

Textbook 2 - Immediate Character Introduction (ICI)

Textbook 2 (Ma Liping [马立平], 2011) written by Dr. Liping Ma from College of Education in Stanford University

follows the ICI pedagogy that a character's pronunciation, meaning, and orthography should be introduced simultaneously. It develops students' character reading without pinyin. Starting from Volume 1, besides the stroke orders, character structures (e.g., up-down, left-right, etc.) and radicals are introduced. The English meaning clues of the radicals are provided and then example characters are listed after each radical. For instance, 扌 is provided with its meaning clue "the hand" and then two characters 挂 (guà, hang up) and 掉 (diào, drop) are listed. 艹 is provided with its meaning clue "grass". Moreover, it helps construct the connection between this radical and the corresponding characters by providing the information "related to plants". Then several example characters with the radical 艹 are listed such as 菜 (cài, vegetable), 花 (huā, flower), and 葡萄 (pú tao, grape). In the radical practice in Textbook 2, students are asked to write down the English meaning clues of the given radicals.

In summary, two textbooks have different starting points in character reading and different emphasis in character writing. There are also differences in the timing and way of introducing radicals between the two textbooks. Moreover, the forms of radical practice in the two textbooks are also distinct.

3.3. Measures

Radical Awareness Task

The radical awareness task was adapted from the Chinese Orthographic Knowledge Test in Chen et al. (2013). Two types of the three subtests in the Chinese Orthographic Knowledge Test were included in the radical awareness task: radical recognition test and semantic radical awareness test. The radical recognition test was aimed at testing whether participants were able to recognize and identify the characters given the target radicals. The Cronbach's α value was .947 (Chen et al., 2013). The semantic radical awareness test was aimed at testing whether participants were able to tell the position of a specific radical in a character and the relationship between the radical and the character. The Cronbach's α value was .881 (Chen et al., 2013).

In the radical awareness pre-task consisting of total eight items, there were four items in the radical recognition test and semantic radical awareness test, respectively. The items in the radical recognition test and semantic radical awareness test were paired together by the same radical. A total of four typical radicals in Chinese orthography were tested (i.e., 木, wood; 艹, grass; 氵, water; 饣, eat). The radical awareness post-task was in the same format of pre-task but with doubled items (16 items) and different content from pre-task in order to reduce the influence on test takers' memorization due to repeated measure.

Character Writing Test

The character writing test was the normal dictation routine given by the teachers. The testing characters were selected from the learning materials for the last week. One character was graded as correct only if it was accurate without any error. The average score of all the dictation tests was used in the data analysis.

4. Results

The independent sample t-tests were used for all measures by condition. The results are presented in Table 1. Statistically significant differences were found in 1st grade radical

awareness post-task, 2nd grade character writing test, radical awareness post-task for all grades, and character writing test

for all grades between the Textbook 1 group (DCI) and the Textbook 2 group (ICI).

Table 1. CHL Independent Sample t-test for All Measures by Condition

Measures	Textbook 1 (DCI)				Textbook 2 (ICI)				df	t	p
	n	M	SD	SE	n	M	SD	SE			
RA pre (G1)	15	5.67	2.41	0.62	5	6.60	1.52	0.68	18	0.81	0.43
RApost (G1)	15	5.13	2.19	0.57	5	6.90	0.96	0.43	16	2.49*	0.02
CW test (G1)	15	7.80	1.93	0.50	5	8.80	1.30	0.58	18	1.07	0.30
RA pre (G2)	31	6.61	1.86	0.33	4	6.75	0.96	0.48	33	0.14	0.89
RApost (G2)	31	7.03	1.59	0.29	4	7.38	0.75	0.38	33	0.42	0.68
CW test (G2)	31	8.81	1.46	0.26	4	9.63	0.48	0.24	13	2.31*	0.04
RA pre (G3)	12	6.58	1.08	0.31	5	7.40	0.89	0.40	15	1.48	0.16
RApost (G3)	12	7.00	1.15	0.33	5	7.60	0.65	0.29	13	1.36	0.20
CW test (G3)	12	8.71	1.57	0.45	5	9.40	0.89	0.40	15	0.91	0.38
RA pre (G4)	27	7.26	0.81	0.16	5	7.40	0.89	0.40	30	0.35	0.73
RApost (G4)	27	7.32	1.02	0.20	5	7.80	0.45	0.20	30	1.03	0.31
CW test (G4)	27	9.15	1.15	0.22	5	9.50	0.70	0.32	30	0.66	0.52
RA pre (All)	85	6.65	1.69	0.18	19	7.05	1.08	0.25	102	1.00	0.32
RApost (All)	85	6.78	1.68	0.18	19	7.42	0.75	0.17	64	2.55*	0.01
CWtest (All)	85	8.72	1.52	0.17	19	9.32	0.90	0.21	45	2.24*	0.03

Note: * $p < .05$

The results of seemingly unrelated regressions and indirect effect for the mediation model 1 in which the mediator was the radical awareness pre-task were similar to the results of the mediation model 2, thus I selected to report the results for one of the two models (mediation model 2, see Figure 1). The radical awareness post-task score in the Textbook 2 group (ICI) was 0.67 higher than in the Textbook 1 group (DCI) in average controlling for grade ($a_2=0.67$, $z(101)=1.85$, $p=.06$). As grade level increased by 1, the radical awareness post-task score increased by 0.49 ($p < .001$) on average controlling for condition. Condition and grade accounted for 15% of the variance in radical awareness post-task ($R^2=0.15$, $p < .001$). The predictor of radical awareness post-task made unique contribution to the character writing test ($b_2=0.76$, $z(100)=13.35$, $p < .001$). The radical awareness post-task,

condition and grade together accounted for 66% of the variance in character writing test ($R^2=0.66$, $p < .001$).

The character writing test score in the Textbook 2 group (ICI) was 0.51 higher than in the Textbook 1 group (DCI) in average via the mediation through radical awareness post-task controlling for grade ($a_2*b_2=0.51$, $z=2.78$, $p=.005$). The 95% bootstrap bias-corrected confidence interval of this indirect effect was [0.18, 0.92], indicating a statistically significant indirect effect mediated through radical awareness post-task. The effect size measured by partially standardized indirect effect was 0.35, which was a large effect size, suggesting that character writing test score in the Textbook 2 group (ICI) was 0.35 standard deviation higher than in the Textbook 1 group (DCI) in average through the mediation effect of the radical awareness post-task controlling for grade.

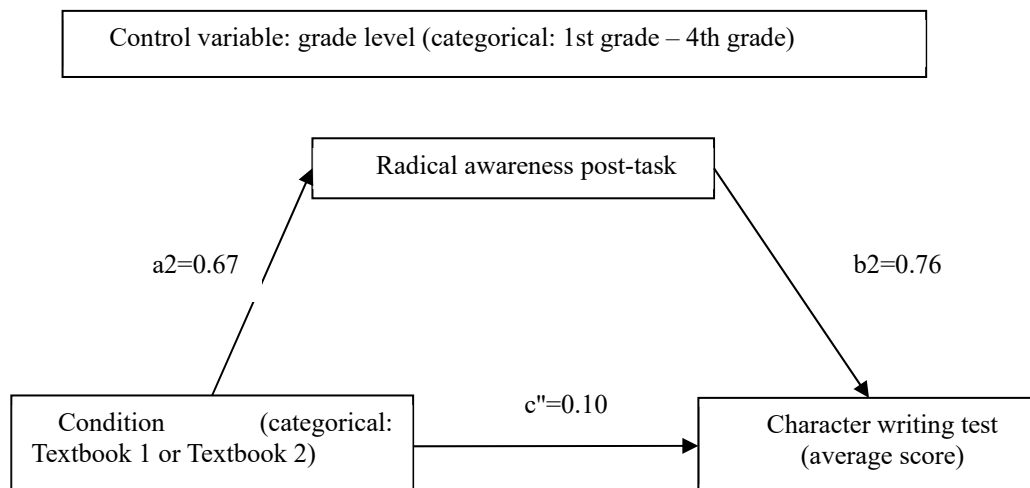


Figure 1. CHL Mediation Model 2 with Coefficients (with Radical Awareness Post-task)

5. Discussion

5.1. Differences in Radical Awareness and Character Writing between Two Textbooks

For all grades, students who learned Textbook 2 (ICI) performed better in radical awareness post-task and character

writing tests than those who learned Textbook 1 (DCI). There was no significant difference in radical awareness pre-task between the two groups for each grade and for all grades, indicating that the CHL learners were at the same level in the beginning. The first grade CHL learners who learned Textbook 2 (ICI) scored higher in radical awareness post-task than those who learned Textbook 1 (DCI), indicating an

earlier advantage in radical awareness establishment for the first three months for Textbook 2 (ICI) CHL learners. Textbook 2 (ICI) has an earlier timepoint of introducing radicals and characters than Textbook 1 (DCI). By giving meaning clues of the radicals, Textbook 2 (ICI) establishes a connection between radicals and characters for CHL learners in an earlier stage. Moreover, the radical practice in Textbook 2 (ICI) helps consolidate this connection which contributes to better performance in radical awareness post-task in 1st grade. The main purpose of the radical awareness task was to test whether the CHL learners was able to sense the relationship between the radical and the character. The excellent performance in radical awareness post-task for 1st grade Textbook 2 group (ICI) provided the evidence that young CHL learners were able to use the radical knowledge to infer the meanings of unknown characters as their native Chinese learner peers (Shu & Anderson, 1997).

The second grade CHL learners who learned Textbook 2 (ICI) performed better in character writing test than those who learned Textbook 1 (DCI), but no significant difference was found in radical awareness post-task between the two groups. As the CHL learners who learned Textbook 1 (DCI) progressed from 1st grade to 2nd grade, they started to establish their radical awareness as Textbook 1 (DCI) started to introduce the concept of radicals and arrange radical-based practice (e.g., ask students to write characters with the given radicals), which reduced the gap in the radical awareness between the Textbook 1 group (DCI) and the Textbook 2 group (ICI). As supported by the previous finding that radical awareness has a positive influence in facilitating character acquisition when the CHL learners' radical awareness has established (Wang et al., 2015; Yin & McBride, 2015), as the Textbook 2 group (ICI) acquired more radicals and established radical awareness, they were able to transfer their ability of understanding the role of the radicals to character writing earlier than the Textbook 1 group (DCI).

5.2. Mediation Effect of Radical Awareness on Character Writing

The mediation analyses explored how the type of textbook affected character writing through the mediation of radical awareness. The results demonstrated that there was a significant mediation effect of radical awareness between the type of textbook and character writing, indicating that the Textbook 2 group (ICI) performed better in character writing than the Textbook 1 group (DCI) through the mediation of radical awareness. The seemingly unrelated regression results of the character writing on the type of textbook suggested that the type of textbook was not a significant direct predictor of character writing. By adding a mediation effect of radical awareness between the type of textbook and character writing, it was clear that radical awareness played an important role in determining the relationship between the type of textbook and character writing. In other words, the Textbook 2 (ICI) developed higher radical awareness for CHL learners, which in turn contributed to better performance in character writing. This finding provides the evidence for the importance and the mediation effect of radical awareness in character acquisition for CHL learners, which is consistent with native Chinese learners (Liu et al., 2017; Yang et al., 2019; Zhang, 2014) and CSL learners (Wong & Zhou, 2022).

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