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A COMPARATIVE STUDY OF TRADITIONAL TEACHING METHOD AND SEMANTIC RADICAL VISUAL MNEMONIC IN MANDARIN CHARACTER RECOGNITON AMONG MALAYSIAN PRESCHOOLERS

Tang Wan Chin & Phoon Hooi San*

School of Educational Studies, Universiti Sains Malaysia, Penang, Malaysia
wanchin.tang@yahoo.com[1], hsphoon@usm.my[2]

*Corresponding Author
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ABSTRACT

Preschoolers often struggle with recognizing Mandarin characters due to their complexity. This study compared the effectiveness of Traditional Teaching Method (TTM) and Semantic Radical and Visual Mnemonic (SRVM) approaches in improving Mandarin character recognition among Malaysian preschoolers, while also exploring age and gender effects. 58 children aged 5 and 6 were involved, with 31 in SRVM and 27 in TTM groups. Over two weeks, 25 characters were taught. Both methods showed positive results, with increased post-test scores in SRVM ($t(30) = -6.75$, $p < .05$) and TTM ($t(27) = -7.79$, $p < .05$) groups, indicating improved learning. However, there was no significant difference between SRVM and TTM groups ($F(1,56) = 0.15$, $p = 0.70$), possibly due to individual learning styles. Age-related differences were not significant ($F(1,54) = 0.08$, $p = .78$), suggesting both methods are effective for 5 and 6-year-olds. Gender differences were also insignificant ($F(1,54) = 0.26$, $p = .61$), indicating similar learning outcomes for males and females. The study suggests a holistic teaching approach focusing on personalized strategies to enhance Mandarin character learning for all preschoolers.

Keywords: Traditional Teaching Method, Semantic Radical, Visual Mnemonic, gender, preschool

INTRODUCTION

In Malaysia, Mandarin holds prominence as a dominant language within the Chinese community, contributing to the country's linguistic diversity alongside Malay, English, Tamil, and other indigenous languages. Mandarin is also a compulsory academic subject in preschool of Chinese community. Learning to understand and recognize Mandarin characters is a fundamental skill for those learning Mandarin. The challenges faced by young learners in mastering Mandarin characters are multifaceted.

Firstly, Mandarin employs a logographic writing system, wherein each character represents a word or concept, contrasting with the alphabetic systems found in many other languages such as English or Malay languages. While English and Malay employ 26 letters for word spelling, Mandarin utilizes 24 fundamental strokes that are combined in various

arrangements to form radicals, the basic components of characters (Sung, 2014). This complexity requires memorization and recognition of thousands of characters, each comprising strokes and radicals. Additionally, in a multilingual environment like Malaysia, where children may be exposed to various languages at home or in their communities. Balancing the acquisition of multiple languages can present difficulties in allocating adequate focus to Mandarin character recognition. Furthermore, the lack of standardized teaching materials and methodologies tailored to Malaysian learners might hinder their progress in mastering Mandarin characters. Effective pedagogical strategies addressing the diverse linguistic backgrounds of students become essential in overcoming these obstacles.

Mandarin Characters

A Mandarin character comprises two essential constituents: strokes and radicals (Yeh et al., 2017). Strokes are fundamental units forming Mandarin characters, determining their form, structure, and overall composition. Various stroke types exist in Chinese characters, each possessing distinct names and forms. For instance, the horizontal stroke (横 héng) is a left-to-right straight line, while the vertical stroke (竖 shù) is a top-to-bottom straight line. Conversely, radicals serve as primary visual processing units in Mandarin characters (Wang et al., 2015; Zhang et al., 2016). These radicals can be categorized into two types: semantic and phonetic. Semantic radicals represent categorical meaning units, while phonetic radicals provide cues for character pronunciation (Yeh et al., 2017). Consider the Mandarin character, 妈 [ma1] "mother," which encompasses the semantic radical 女 [nü3] signifying "female" and the phonetic radical 马 [ma3] for "horse." In this context, 妈 [ma1] "mother" associates the concept of female with its meaning, while its pronunciation mirrors the phonetic radical 马 [ma3]. The semantic radical 女 [nü3] comprises three strokes: horizontal, vertical, and hook strokes. In contrast, the phonetic radical 马 [ma3] consists of horizontal, vertical, left-falling diagonal, and right-falling diagonal strokes.

Semantic radicals hold significant roles in constructing Mandarin characters, aiding in recognition and semantic interpretation. Two crucial elements aiding Mandarin character recognition within semantic radicals are category consistency and spatial configuration. Category consistency entails alignment or correspondence between a semantic radical's meaning or category within a Chinese character. For example, characters like 妈 [ma1] "mother," 妹 "younger sister," 姐 "elder sister," 奶 "grandmother," 娃 "baby girl" consist of semantic radical 女 [nü3], depicting female-related persons, also indicating category consistency in Mandarin characters. Studies confirm that consistent semantic radicals aid in Mandarin character recognition (Liu et al., 2014; Qian et al., 2013). Spatial configuration, on the other hand, refers to the arrangement or positioning of various radicals or components within a Chinese character. These radicals exhibit diverse spatial configurations, facilitating character comprehension. There are thirteen identified spatial configurations in Mandarin characters (Fu, 1989). The character 妈 [ma1] "mother" adopts a left and right spatial configuration, with 女 [nü3] positioned on the left and 马 [ma3] on the right. Proficiency in understanding both spatial configurations and semantic consistency enriches Mandarin character learning.

Challenges in Mandarin Character Recognition

The recognition of Mandarin characters among children is influenced by a combination of internal and external factors. In terms of internal factors, children's orthographic awareness plays a crucial role, involving knowledge of radicals within characters and their placement. Studies suggest that by age four to five, children start understanding the role of radicals, rapidly improving their grasp of radical usage as characters take shape (Liu et al., 2014; Qian et al., 2013). Cognitive abilities, such as visual working memory (VWM), also impact character recognition. VWM, which temporarily stores visual items, is limited in capacity, and can affect the recognition of Mandarin characters due to their complex visual nature. VWM enables the temporary storage of three to four visual items (Mance et al., 2013). The capacity of VWM for Mandarin characters can be as low as a single character (Schurgin & Brady, 2019). Additionally, visual-spatial perception, encompassing the ability to discern various aspects of figures, is essential due to the intricate spatial configurations of Mandarin characters. Given the intricate spatial configurations of Mandarin characters (Fu, 1989) due to their nonlinear visual processing, involving left-to-right, up-to-down, inside-outside, enclosed, semi-enclosed, and inside stroke patterns, more advanced spatial processing is required. McBride (2016) suggests that the distinctive visual attributes of Mandarin characters may prompt children to develop categorization techniques for character recognition.

In terms of external factors, particularly the instructional practices of preschool teachers, significantly affect children's character recognition. The teaching methods utilized by preschool teachers have a substantial impact on how effectively children learn and retain knowledge related to character recognition (Prescott, 2014). These instructional practices can vary widely and encompass various aspects, including the use of visual aids and interactive activities. Ultimately, the quality and effectiveness of the teaching methods employed in preschool settings can greatly influence children's proficiency in recognizing characters and laying the foundation for their literacy development. In summary, factors influencing children's ability to recognize Mandarin characters encompass orthographic awareness, cognitive capacities like VWM and visual-spatial perception, as well as the instructional methods employed by preschool teachers.

Instructional Methods in Mandarin Character Learning

Effective teaching methods significantly impact Mandarin character recognition in Malaysian preschoolers, particularly in a linguistically diverse environment like Malaysia. The Traditional Teaching Method (TTM) commonly applied in Mandarin character instruction often emphasizes repetition and rote learning, focusing on familiarity and basic recognition (Lam, 2011). TTM tends to rely on mechanical drilling and memorization, lacking in-depth explanation of Mandarin character construction and may feel repetitive, disengaging, and less contextually relevant (Tsai, 2021). Consequently, it may not effectively encourage deeper understanding or association of characters with their meanings.

Utilising innovative and engaging pedagogical approaches is essential in early childhood education. Numerous such approaches have been explored in recent research. For instance, Mustika et al. (2025) demonstrated that picture-based educational modules effectively capture young learners' attention, enhance comprehension, and improve the quality of educational materials, with the potential for broad application across various subjects and

learning environments. Similarly, Rostan et al. (2020) found that multisensory techniques used by teachers during reading lessons on open syllables positively influenced children's reading skill development. However, it is important to note that these studies primarily focused on non-Mandarin language instruction.

In Mandarin language learning, visual mnemonics, a learning technique using visual images to aid memorisation, substantially enhance retention and recall during learning (Chang et al., 2022). This strategy improves memory retention of both orthographic and semantic aspects, linking character shape with meaning in Mandarin characters. For instance, teaching the character 妈 [ma1] "mother" could involve using an image that visualizes the configuration of “mother" to enhance memory retention. Semantic radicals convey character meaning, and when combined with visual mnemonics, form the Semantic Radical and Visual Mnemonic (SRVM), potentially serving as a useful method for Mandarin character recognition. SRVM classifies character meanings using semantic radicals while employing visual mnemonics to improve memory retention of Mandarin characters. This combined approach aims to enhance children's ability to recognize Mandarin characters effectively.

Cognitive Load Theory and Dual Coding Theory

The application of Semantic Radical and Visual Mnemonic (SRVM) finds its foundation in Cognitive Load Theory (CLT) and Dual Coding Theory (DCT). Cognitive Load Theory (CLT) delineates how working and long-term memory process information, positing that optimal learning occurs when cognitive load is balanced (Lu et al., 2020). It identifies intrinsic, extraneous, and germane cognitive load types. Sensory memory plays a vital role in information processing, enhanced by methods like SRVM, reducing cognitive load by making content more salient and manageable. Semantic radical classification groups characters, easing cognitive effort by leveraging shared associations within categories.

Dual Coding Theory (DCT), supported by SRVM, suggests that cognition involves visual and verbal coding (Paivio, 1986). Visual coding processes concrete information from visual images, while verbal coding deals with sounds like language pronunciation. These coding methods, although functionally independent, can bolster recall through their combined effects.The integration of SRVM within CLT and DCT frameworks reinforces connections between images, Mandarin characters, and meanings. Similarly, the semantic radical approach breaks down complex characters into smaller, meaningful components, aiding understanding of character formation and relationships. SRVM is posited to support Mandarin character learning more effectively than traditional rote memorization methods (TTM).

Effectiveness of Semantic Radical Visual Mnemonic in Mandarin Character Recognition

To date, no study has specifically investigated the effectiveness of SRVM in Mandarin character recognition among preschoolers. However, there are studies that have specifically examined the effectiveness of either semantic radicals or visual mnemonics individually. There are two studies exploring the role of semantic radicals in Mandarin characters learning within preschool contexts. These studies include works by Li et al. (2021) and Chen (2019). Li et al. (2021) studied 116 Chinese preschoolers aged four to five, focusing on semantic radical awareness in Mandarin characters. They explored semantic radicals with and without category consistency, finding incomplete development of category consistency awareness. Children favoured phonetic radicals over semantic ones for character classification, indicating phonetic radical dominance in recognition. Chen (2019) examined 107 children aged three to six in

Taiwan, observing character structure awareness. Younger children showed early character structure understanding, with age influencing character knowledge. Character and radical comprehension predicted concurrent character reading. Both studies note age-based character recognition differences, highlighting a need for future age-focused investigations. Gender's impact on learning remains unexplored and should be examined in future studies.

The studies that employed visual mnemonics are available for school-aged children, but not preschool children. Tsai et al. (2021) investigated the impact of key-image mnemonics (KIM) on first-grade elementary students' Mandarin learning in Taiwan. Compared to traditional methods, KIM significantly enhanced Mandarin character recognition and learning interest. However, this study focused on school-aged children, necessitating further exploration into preschool-aged learners' response and gender influences. Pengfei et al. (2018) investigated the effectiveness of a key-image picture-based method for teaching Mandarin characters to school-aged non-native language learners in an online classroom. They conducted a study involving 65 children from a California elementary school, dividing them into experimental and control groups. The experimental group received 15 online lessons over three months, while the control group had traditional classroom instruction. The results revealed enhanced literacy and vocabulary skills among the experimental group. Similarly, Zhou (2021) examined the impact of teaching Pictographic Mandarin characters to 22 children in Western Sydney, including various cultural backgrounds. Using formative assessments, post-it notes for feedback, and interviews, the study highlighted the value of pictographs in strengthening children's memory of Mandarin characters. However, the study faced limitations, including a small sample size and challenges in student self-reflection, especially among young learners. Both studies underscored the importance of pictographic methods in improving Mandarin character recognition among school-aged foreign language learners. Based on the previous literature, it is worthwhile to compare the effectiveness of semantic radical and visual mnemonic (SRVM) and Traditional Teaching Method (TTM) in Mandarin characters recognition among preschool children.

Research Objectives

The research objectives of this research include:

1. To assess the effectiveness of Traditional Teaching Method (TTM) and the Semantic Radical and Visual Mnemonic (SRVM) in Mandarin word recognition among preschoolers.
2. To identify the significant difference of effectiveness of the Traditional Teaching Method (TTM) and the Semantic Radical and Visual Mnemonic (SRVM) in Mandarin word recognition before and after the lessons.
3. To identify the significant difference between five- and six-years old children in terms of their Mandarin character recognition accuracy after the Traditional Teaching Method (TTM) and the Semantic Radical and Visual Mnemonic (SRVM) lessons.
4. To identify the significant difference between male and female children in terms of their Mandarin character recognition accuracy after the Traditional Teaching Method (TTM) and the Semantic Radical and Visual Mnemonic (SRVM) lessons.

METHODOLOGY

Research design and sampling method

A quantitative method was employed in this research involving the quasi-experimental method. The children were grouped into Traditional Teaching Method (TTM) group and Semantic Radical and Visual mnemonic (SRVM) group. Purposive sampling method was used to recruit the participants. A kindergarten located in Penang Island, Malaysia was identified, and invited to participate in this study. Mandarin language served as the instructional medium in this preschool.

Participants

A total of 58 Chinese children participated in this study, as depicted in Table 1. The experimental group engaged in SRVM, while the comparison group utilized TTM. Within the five-year-old group, the experimental group comprised 17 children contrasting with 11 children in the comparison group. In the six-year-old group, experimental group consisted 14 children contrasting with 16 children in the comparison group. There were 31 children in the experimental group, while there were 27 children in the comparison group.

Table 1
Number of participants according to age and gender based on the experimental and comparison group

	Experimental group (SRVM)			Comparison group (TTM)		
Ages	Male	Female	Total	Male	Female	Total
5	8	9	17	5	6	11
6	8	6	14	8	9	16
Total	16	15	31	13	15	27

Research Instruments

This study utilized various research instruments, including participant's demographic survey form, SRVM and TTM flashcards as well as pre- and post-test stimuli and scoring forms.

Participant's demographic survey form

The participant demographic survey form collected essential information from the children's parents through class teachers. It gathered data such as child's name, parents' occupation and education level, gender, ethnicity, language usage, percentage of language usage, and participation in reading or Mandarin language enrichment classes.

Semantic radical and visual method (SRVM) and Traditional Teaching method (TTM) flashcards

SRVM flashcards (Appendix A1) were used to instruct the experimental group during SRVM implementation, displaying visual images of targeted semantic radicals and Mandarin characters. In contrast, TTM flashcards (Appendix A2) were employed for the comparison

group without visual images, containing standard form of semantic radicals and Mandarin characters.

A total of 25 Mandarin characters were the focus of the lessons, selected based on two criteria. Firstly, characters were chosen using semantic radicals that consistently portrayed a particular category. For instance, characters like 妈 "mother", 妹" younger sister" 姐 "elder sister", 奶 "grandmother", 娃 "baby girl" all incorporate the semantic radical 女, representing female-related persons with consistent meanings. Secondly, characters with a uniform left-to-right spatial configuration were included. In these characters, the semantic radical女 appeared on the left, while the phonetic radical was positioned on the right.

Pre-test and post-test stimuli and scoring forms

The pre-test and post-test stimuli were used to evaluate children's accuracy in recognizing semantic radicals and Mandarin characters before and after implementing SRVM and TTM respectively. Each stimulus had two sections: Section A assessed five semantic radical themes, while Section B evaluated Mandarin character recognition. To assess recognition ability, each targeted Mandarin character was paired with corresponding distractors: Type A distractor (Mandarin character with the same semantic radical feature); Type B distractor (Mandarin character with the same orthographic feature) and Type C distractor (non-relevant Mandarin character, with different semantic radical and orthographic features). Distractors ensured comprehension beyond chance guessing. The post-test mirrored the pre-test but randomized the arrangement of characters and distractors to prevent memorization. Three experts, including two Mandarin language teachers and the principal with at least ten years of early childhood education experience, validated the content validity of the pre- and post-test stimuli and scoring forms.

Data Collection and Lesson Implementation Procedures

The pre-test and post-test procedures for both groups were the same, encompassing the identification of semantic radicals and Mandarin characters, followed by the recording of responses. Pre-test was done a week prior to the implementation of the lessons, while post-test was conducted a week after the lessons. Five one-hour sessions were conducted over approximately two weeks. Each session covered one semantic radical theme and introduced five corresponding Mandarin characters. Lesson plans consisted of set induction, semantic radical, and targeted Mandarin character teaching, uniformly executed in both groups.

The following were the steps taken within the experimental group: The SRVM flashcard for the semantic radical was presented by the teacher, visually depicting the corresponding semantic radical. Meanings were independently deduced by the children from these visual images. Subsequently, the meaning of semantic radical was explained by the teacher. The directive instruction "blink your eyes and look at this" was used by the teacher to prompt the internalization of the visual representation. SRVM flashcards featuring the targeted Mandarin characters were then presented. The visual representation of targeted words was presented by the teacher one by one. Meanings related to these visual images were provided. Next, the orthographic representation of targeted word was displayed, fostering an immediate connection to aid the children in comprehension and linking it to the targeted Mandarin character. The directive instruction "blink your eyes and look at this" was employed by the teacher to encourage the children to internalize Mandarin character.

Below were the steps taken within the comparison group: The TTM flashcards for the semantic radical were presented by the teacher. The children were prompted to refer directly to the TTM flashcards displaying the semantic radical and deduce its meaning. Following this, the meaning of the semantic radical was provided by the teacher. The directive instruction "blink your eyes and look at this" was used by the teacher to encourage the children to internalize the semantic radical. Then, the TTM flashcards featuring the targeted Mandarin characters were presented one by one. Subsequently, the children were encouraged to refer directly to the Mandarin character and deduce its meaning. The meaning of the Mandarin character was subsequently conveyed by the teacher. The directive instruction "blink your eyes and look at this" was employed by the teacher to encourage the children to internalize Mandarin character.

Data Analysis

Both descriptive and statistical analyses were employed in this research. Quantitative data obtained from the pre-test and post-test scoring forms were analyzed descriptively and inferentially using the IBM® SPSS® software platform. Statistical analyses, including the paired t-test, will assess the effectiveness of SRVM and TTM. Additionally, ANCOVA will be utilized to examine significant differences between the SRVM and TTM groups, as well as to explore potential effects of gender and age groups on Mandarin word recognition.

RESULTS

The first research objective was to assess the effectiveness of Traditional Teaching Method (TTM) and the Semantic Radical and Visual Mnemonic (SRVM) in Mandarin word recognition among preschoolers. Paired t-tests were conducted to assess the significance of the pre-test and post-test scores. The mean percentages and standard deviations of pre-test and post-test scores for both the experimental and comparison groups are presented in Table 2. The post-test scores increased for both groups following the lesson. Specifically, the pre-test and post-test scores for the experimental group were (M=42.06, SD=20.29) and (M=59.61, SD=21.28) respectively, while for the comparison group, the scores were (M=48.43, SD=25.02) and (M=65.86, SD=22.82) respectively. The results indicated a significant difference within both groups, as observed in the experimental group ($t(30) = -6.75$, $p < .05$) and the comparison group ($t(27) = -7.79$, $p < .05$).

Table 2

Mean Percentages and Standard Deviation of Pre- and Post-test Scores for Experimental and Comparison Groups

Group	Pre-test		Post-test	
	Mean	Std Deviation	Mean	Std Deviation
Experimental	42.06	20.29	59.61	21.28
Comparison	48.43	25.02	65.86	22.82

The second objective of the research was to identify the significant difference in effectiveness of the Traditional Teaching Method (TTM) and the Semantic Radical and Visual Mnemonic (SRVM) in Mandarin word recognition before and after the lessons. To ensure any observed differences in post-test scores can be attributed to the teaching method rather than pre-existing

differences between the groups, ANCOVA was conducted to examine the significant differences in their pre-test and post-test scores for both the experimental and comparison groups. The mean percentages and standard deviations of gain scores for the experimental and comparison groups are presented in Table 3. The gain scores for the experimental group and comparison group were (M=59.61, SD=21.28) and (M=65.86, SD=22.82) respectively. The results indicated no significant difference in the gain score of Mandarin character recognition between experimental group and comparison group, $F(1,56) = 0.15$, $p = 0.70$.

Table 3

Mean Percentages and Standard Deviation of Gain Scores for Experimental and Comparison Groups

Group	Mean	Std Deviation
Experimental	59.61	21.28
Comparison	65.86	22.82

The third objective of the research was to identify the significant difference between five- and six-years old children in terms of their Mandarin character recognition accuracy after the Traditional Teaching Method (TTM) and Semantic Radical and Visual Mnemonic (SRVM) lessons. ANCOVAs were conducted to examine potential significant age differences in Mandarin character recognition accuracy between children aged five and six years old. The mean percentages and standard deviations of the gain scores for experimental and comparison groups based on age group are presented in Table 4. The gain scores for the experimental group in both age categories were (M=16.47, SD=16.73) and (M=18.57, SD=11.80) respectively. For the comparison group, the gain scores in both age categories were (M=14.91, SD=11.33) and (M=19.06, SD=12.21) respectively. The results indicated no significant difference in the gain score of Mandarin character recognition between five and six year-old groups, $F(1,54) = 0.08$, $p = 0.78$.

Table 4

Mean Percentages and Standard Deviations of Gain Scores by Age Group for Experimental and Comparison Groups

Age	Experimental group		Comparison group	
	Mean	Std Deviation	Mean	Std Deviation
5	16.47	16.73	14.91	11.33
6	18.57	11.80	19.06	12.21

The fourth objective of the research was to identify the significant difference between male and female children in terms of their Mandarin character recognition accuracy after the Traditional Teaching Method (TTM) and Semantic Radical and Visual Mnemonic (SRVM) lessons. ANCOVA was employed to determine potential gender differences in Mandarin character recognition accuracy between male and female children. The mean percentages and standard deviations of the gain scores for the experimental and comparison groups based on gender are presented in Table 5. The gain scores for the experimental group in both gender groups were (M=18.32, SD=14.69) and (M=16.00, SD=14.77) respectively. For the comparison group, the gain scores in both gender categories were (M=16.57, SD=11.41) and (M=18.29, SD=12.62)

respectively. The analysis revealed no significant difference in Mandarin character recognition gain scores between the male and female children, $F(1,54) = 0.26$, $p = 0.61$.
Table 5

Mean Percentages and Standard Deviations of Gain Scores by Gender for the Experimental and Comparison Groups

Gender	Experimental group		Comparison group	
	Mean	Std Deviation	Mean	Std Deviation
M	18.32	14.69	16.57	11.41
F	16.00	14.77	18.29	12.62

DISCUSSION AND IMPLICATIONS

The increase in post-test scores for both groups after the lesson suggests that both Traditional Teaching Method (TTM) and Semantic Radical and Visual Mnemonic (SRVM) were effective in aiding children's learning and recognition of Mandarin characters. This conclusion is drawn from the improved performance demonstrated by the children in the post-test compared to their pre-test scores. Overall, the increase in post-test scores suggests that both teaching methods positively impacted the children's learning outcomes in Mandarin character recognition.

However, the results of this study which found the lack of statistical significance in the gain score between the SRVM and TTM groups were contrast with those of Tsai et al. (2021), who found that Key Image Mnemonic was more effective than traditional teaching approaches. However, it's important to note that Tsai et al. (2021) concentrated on school-aged children, posing a difficulty in determining if similar results would apply to younger preschoolers in this study, who are less involved in formal academic learning. There could be two possible reasons why children in SRVM did not outperform the children in TTM as posited. Firstly, the effectiveness of a teaching method might vary based on the learning style and preferences of individuals. It's possible that SRVM, although effective for some learners, might not have suited the learning preferences or learning styles of the participants in this specific study. Therefore, it's crucial to understand the diverse learning styles and preferences of children, a concept that benefits both children and teachers (Awla, 2014). Supporting this, a study involving 568 nursery children from National Child Development Centers in the Philippines (Aquino et al., 2019) revealed that children showed varying levels of competence across different learning domains such as social and emotional development, self-management, perceptual and motor skills, early math, literacy, and both receptive and expressive language. This suggests that children exhibit strengths in different areas, reinforcing the need for teaching strategies that accommodate a range of learning styles. Thus, acknowledging and considering children's learning styles before delivering lessons is paramount for teachers. This awareness can help teachers identify more effective teaching methods. Secondly, the duration and intensity of exposure to the teaching methods might have been inadequate to see the differences between the SRVM and TTM groups. It is worth noting that the lessons were implemented over a period of 2 weeks across 5 sessions. The results might vary if the lessons were extended over a longer period. The minimal duration needed to observe the effectiveness of teaching can vary significantly depending on the children (Vaughn et al., 2012). In some cases, the effects of teaching may be noticeable in a relatively short period, such as a few days or weeks. However, for long-term learning outcomes, it may take months or even years to see significant changes or improvements. Ultimately, the effectiveness of teaching methods should be assessed through

continuous evaluation over an extended period to capture both short-term and long-term impacts on student learning and development.

In terms of age effect, this study revealed that there was no significant difference between 5 and 6 years old children in their Mandarin character recognition. The finding was dissimilar with the findings of Li et al. (2021) and Chen (2019), which indicated age-related differences in character recognition. In their research, children exhibited increased character knowledge as they grew older. However, Li et al. (2021) noted that the awareness of semantic radical category consistency had not fully developed in 4- and 5-year-old children. Essentially, both age groups were still in the process of learning and acquiring semantic radicals. There could be several reasons why there was no significant difference in the gain score of Mandarin character recognition between the five and six-year-old groups in this study. Firstly, the teaching methods used in the study may have been equally effective for both age groups as the teaching method was well-designed to accommodate the developmental needs and abilities of both five and six-year-olds, it's possible that both groups achieved similar gains in Mandarin character recognition. Secondly, the sample size within each age group may not have been large enough to detect significant differences between them. With a small sample size, even if there are subtle differences in learning outcomes between the age groups, they may not reach statistical significance. Lastly, there may have been considerable variability in the Mandarin character recognition abilities within each age group. This variability could have obscured any potential differences between the five and six-year-old groups.

In terms of gender effect, this study found no significant differences in Mandarin character recognition accuracy between male and female children following SRVM and TTM lessons. It's worth noting that there is insufficient research evidence to indicate a gender-based impact on Mandarin character recognition now. For example, while studies by Li et al. (2021) and Chen (2019) examined age-related effects in Mandarin character recognition, they did not investigate gender effects despite including both male and female participants. Several factors could contribute to the lack of a significant difference in Mandarin character recognition gain scores between male and female children. Firstly, both male and female children may have had similar exposure to Mandarin characters and comparable learning experiences, resulting in similar gains in recognition scores. Secondly, there may be considerable variability in Mandarin character recognition abilities within each gender group, thus this variability could mask any potential differences between genders, leading to non-significant results. Thirdly, the sample size of the study may not have been large enough to detect significant differences between male and female children. With a small sample size, even if there are subtle differences in Mandarin character recognition gains between genders, they may not reach statistical significance.

The study's findings suggest that both Traditional Teaching Method (TTM) and Semantic Radical and Visual Mnemonic (SRVM) are effective in improving Mandarin character recognition among children. However, it's essential to recognize that individuals may have diverse learning styles and preferences. This highlights the importance of considering these factors when selecting teaching methods to ensure optimal learning outcomes. Future studies could consider profiling the learning styles of learners when implementing a new instructional method to examine the impact of learning styles on effectiveness of instructional method. Conducting further research with longer durations and larger sample sizes would provide a more comprehensive understanding of instructional method effectiveness. Additionally, exploring age or gender-related differences in language learning could offer valuable insights into tailoring teaching approaches to specific demographics.

CONCLUSION

Overall, the findings of the study suggest that teachers can adopt a holistic approach to teaching Mandarin characters, focusing on individualized strategies to maximize learning outcomes for all preschool children.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this study.

AUTHOR CONTRIBUTIONS

The author was responsible for the conception and design of the study, data collection, data analysis, interpretation of the findings, and preparation of the manuscript.

DECLARATION OF GENERATIVE AI USE

No generative artificial intelligence (AI) tools were used in the design, data collection, analysis, interpretation of the findings, or writing of this manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the author upon reasonable request.

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