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Issues of Strategies and Multimedia Integration in Chinese Character Deeper Learning Instruction

Jin Yulu, Md Nasir Masran, Nik Muhammad Hanis*, Liu Lifei

Faculty of Human Development, Universiti Pendidikan Sultan Idris,
35900 Tanjong Malim, Perak, Malaysia

*Correspondence: mdhanis@fpm.upsi.edu.my

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ABSTRACT

Deep learning has become a focal point in education, particularly in fostering 21st-century skills such as problem-solving, critical thinking, and deep semantic understanding. However, in the context of Chinese character learning, challenges persist in developing deep semantic understanding and higher-order cognitive skills such as problem-solving and critical thinking. This study aims to explore the teachers' perspectives on challenges, strategies, and multimedia integration in Chinese character deeper learning. A survey was administered to 325 primary school Chinese language teachers, selected through simple random sampling, using a structured needs analysis questionnaire. The findings highlight significant difficulties in students' comprehension of Chinese character glyphs and meanings, limitations in teachers' pedagogical approaches, as well as the inadequate application of multimedia for fostering deeper learning. These findings highlight the need for more effective pedagogical strategies and multimedia integration to enhance deep learning in Chinese character instruction, and proposed the necessity of structured, multimedia-assisted instructional modules. This study lays the groundwork for future research on the impact of multimedia-enhanced interventions on students' deep learning, cognitive development and long-term retention in Chinese character learning.

Keywords: Deeper learning, Chinese character, Instructional challenges, Pedagogical strategies, Multimedia integration

INTRODUCTION

In today's fast-developing society, most people urgently require children to develop the basic skills needed to solve complex challenges and be competitive in the global economy to adapt to the rapid development of society and the market demands of society (Snape, 2017). Deeper learning, a hot topic in the education field, is recognized internationally as the key point of capability development in the 21st century, which emphasizes students' ability to transfer knowledge, think critically, and apply learning in novel situations (Pellegrino & Hilton, 2012; Bråten & Skeie, 2020). In the context of Chinese literacy, fostering deeper learning is essential for developing students' cognitive abilities and enhancing their long-term academic success.

Chinese characters, as an important part of Chinese subjects in primary school, are the prerequisite and guarantee for cultivating core Chinese abilities, an important way to cultivate students' intelligence (Jiang, 2017). However, their complex structure—comprising graphemic, phonemic, and semantic components—creates significant learning challenges, increasing cognitive load and impeding retention (Huang, 2021). Traditional teaching methods primarily rely on rote memorization, often overlooking character composition rules and leading to frequent composition errors (Chen, 2022; Lin, Lim & Wu, 2022). Moreover, a lack of diverse teaching strategies and contextual learning further

reduces student motivation and problem-solving abilities (Huang, 2021; Ma, 2023). Additionally, many teachers struggle to integrate 21st-century skills due to outdated pedagogical mindsets (Liu, 2020).

Given these challenges, exploring effective pedagogical approaches to support deeper learning in Chinese character instruction is imperative. The integration of multimedia technology is widely used in various teaching fields and has a certain role in promoting teaching and enhancing learning (Castro-Alonso et al., 2019; Mayer, 2021; Kühl & Münzer, 2023), including Chinese literacy teaching and learning (Jiang, 2017; Dai & Yang, 2022). Studies show that multimedia-assisted teaching enhances character recognition, writing skills, and phonetic memory by visually and auditorily reinforcing character structures (SARI, 2017; Chen et al., 2014; Li, 2023). These findings highlight the potential of multimedia to support deeper learning in Chinese character instruction.

Therefore, this study aims to investigate the issues teachers observe from students' performance during Chinese character instruction, the strategies they employ to foster deep learning, and the role of multimedia technology in enhancing this process.

OBJECTIVE

The purpose of this study has been following specific research objectives, which are:

1. What challenges do elementary school teachers observe their students face in learning Chinese characters?
2. What teaching strategies do teachers use to foster deep learning in Chinese character instruction?
3. How do teachers apply multimedia technology in Chinese character teaching?

LITERATURE REVIEW

Deep Learning

Deeper learning is the opposite of surface learning. Deeper learning was first proposed by Marton and Säljö (1976). It refers to that students who adopt a deeper learning tend to have more intrinsic interest, focus on understanding, emphasize meaning, concentrate on the connections between the parts of the learning content, and systematically state assumptions about the overall structure of the problem or concept. Based on this basic definition, meaningful learning (Winje & Løndal, 2020) and the cognitive domain of deep learning (NRC, 2012; AIR, 2016) was adopted in this study.

The cognitive domain of deep learning includes three elements in this study, i.e., understanding of core academic content, critical thinking, and problem-solving (AIR, 2016), which align closely with the essential 21st-century skills needed for success in an increasingly complex and interconnected world.

Chinese Character Teaching and Learning

Chinese characters, the world's oldest continually used writing system, consist of three components which are graphemic component (shape), phonemic component (sound), and semantic component (meaning) (Christensen & Warnick, 2006). These components form the core academic content of this study and are key elements of the cognitive domain in deep learning.

However, there are some issues that influence students' deep learning on Chinese characters. Firstly, the inherent complexity of Chinese characters, with their intricate graphemic, phonemic, and semantic components, increases cognitive load and makes recognition and retention difficult (Huang, 2021). Additionally, traditional instruction often neglects character composition rules, relying on rote memorization rather than structural understanding (Chen, 2022). Studies show that 54.4% of the mistakes made by low-grade students occur in the shape of Chinese characters, and composition errors are as high as 50% (Lin, Lim & Wu, 2022).

Secondly, the lack of multiple and efficient strategies in the teaching of Chinese characters leads to a lack of interest and intrinsic motivation in learning Chinese characters among students (Huang, 2021; Ma, 2023). Low learning interest and intrinsic motivation will affect students' deep learning (Núñez & León, 2016). Thirdly, being out of context is another issue, which is not conducive to students' understanding of Chinese characters, and is not beneficial to cultivate students' transfer learning and problem-solving abilities, further to hinder students' deep learning (Huang, 2021). Last but not least, many teachers have yet to integrate 21st-century skills into character instruction, as traditional mindsets persist (Liu, 2020). While these studies highlight key challenges, further investigation is needed to explore the issues and teachers' real instructional practices.

Multimedia Integration in Language Education

Multimedia, defined as a combination of various media such as text, audio, and video, can effectively facilitate Chinese character learning by engaging multiple sensory channels and promoting meaningful learning outcomes (Almara'beh, Amer & Sulieman, 2015; Mayer, 2009). According to the cognitive theory of multimedia learning (CTML), multimedia learning helps learners process information through visual and auditory elements, actively engaging them in the cognitive process, which enhances retention, transfer, and ultimately, learning performance (Mayer, 2005; Castro-Alonso et al., 2019). In particular, multimedia strategies can reduce cognitive load, thus enabling deep learning by supporting the storage and retrieval of information (NRC, 2012; Paivio, 1990).

Empirical studies support the effectiveness of multimedia-enhanced instruction in Chinese character learning. For instance, character recognition and retention have been shown to improve when multimedia techniques are employed, as reported in a comparative study by SARI (2017). In the context of pinyin acquisition, the use of sound-enhanced flashcards proved beneficial for beginners, demonstrating notable improvements in memory (Zhu, 2010). Further, Chen et al. (2014) identified that integrating stroke-sound associations and radical-highlighting into instruction significantly strengthened learners' writing and recognition abilities. What's more, Li (2023) emphasized the potential of multimedia tools to enhance learning outcomes by restructuring Chinese characters into meaningful components and reinforcing the linkages among orthography, semantics, and phonetics.

However, some studies have pointed out that challenges remain, such as the repeated use and misuse of multimedia technology can affect the development and improvement of students' abilities and hinder learning (Xu et al., 2019). There are especially challenges in how to effectively embed multimedia tools in Chinese character learning (Chen et al., 2014). Zhu's (2010) study pointed out that the inclusion of stroke order animation had a detrimental effect on character shape and pinyin memory, which is inconsistent with Chen et al. (2014) and Li's (2023) study, highlighting current multimedia instructional misunderstandings in current multimedia teaching. The latter found that viewing animated stroke writing sequences helped to enhance students' understanding of the hierarchical structure of Chinese characters and the relative position of each stroke in the characters. These contradictions highlight current instructional misunderstandings and indicate areas for improvement in multimedia integration.

METODOLOGI

A quantitative study using survey questionnaire was employed in this study to explore issues on deeper learning in aspect of Chinese characters learning performance, and teaching strategies and multimedia technology used.

Participants

Chinese subject teachers who teaching Chinese in primary schools are the target group at this phase. Simple random sampling was adopted to collect data from the population (N=2148) in Wenling City, as every participant who teaches Chinese subject is given an equal chance of being selected. According to Krejcie and Morgan (1970), n=325 teachers were selected as the sample size. The sample is sent out

questionnaires to collect the data of the issues occur in their teaching Chinese characters in their class and to know their views on developing the module.

Instrument

A designed questionnaire was adopted to determine the issues that occurred in the Chinese character instruction. The questionnaire contains 5 parts: Part A- Demographic Information (5 basic personal details); Part B- Students' Performance (18 items categorized into pronunciation [items 1-5], writing [items 6-9], and understanding [items 10-18] (Christensen & Warnick, 2006); Part C- Deeper Learning Instructional Strategies (15 items based on literature on strategies for promoting deep learning) (Hu & Dong, 2017; Tao, 2021; Xu, 2022; Golightly & Raath, 2015; Hu & Li, 2020); and Part D- Multimedia Resources (20 items based on the 11 principles of CTML) (Mayer, 2017). Parts B, C, and D are answered using a 5-point Likert scale, ranging from 1 ('Strongly Disagree') to 5 ('Strongly Agree').

Table 1 Results of reliability and content validity for needs analysis questionnaires

Section	Number of items	Cronbach's alpha values	I-CVI
Part B- Students' Performance	18	.901	0.99
Part C- Deeper Learning Instructional Strategies	15	.893	0.89
Part-D Multimedia Resources	20	.912	0.97
Overall	53	.955	
S-CVI			0.95

Table 1 shows the results of reliability and validity of the questionnaire. The validity and reliability of the questionnaire were ensured by a small-scale pilot study (n=30) (with the Cronbach's alpha coefficient of 0.955) and six-experts agreements using Content Validity Index (CVI) with the S-CVI of 0.95. Which indicated the items with high content validity for the construct of the needs analysis and are highly correlated and measure the same underlying construct consistently.

Data Collection

Data was collected after getting the help from the headmasters of each primary schools to send the questionnaire link to the teachers who are teaching Chinese subject. The teachers can only fill out the questionnaire after signing an informed consent form in the first page of the questionnaire. One week was given to complete the questionnaire. Descriptive statistics, like Percentage, Frequency, Mean, Standard Deviation and Rate, were used to analysis the quantitative data collected by the questionnaire. Content analysis was used to address the qualitative data.

RESEARCH FINDINGS

Descriptive Findings on Students' Performance

Table 2. Results of the Situation of Students Learning Chinese Characters

Construct	Item	M	SD
Students' Pronunciation of Chinese Characters	1.	2.46	0.94
	2.	2.87	0.907
	3.	2.60	0.972
	4.	2.48	1.104
	5.	2.78	0.989
	Total	2.638	0.982
	6.	2.20	1.08

continued

Students' Writing of Chinese Characters	7.	2.31	1.011
	8.	2.36	1.005
	9.	2.82	0.871
	Total	2.423	0.992
Students' Understanding of Chinese Characters	10.	2.40	1.074
	11.	2.46	1.010
	12.	2.43	1.045
	13.	2.51	1.041
	14.	2.32	1.064
	15.	2.41	1.073
	16.	2.42	1.099
	17.	2.30	1.081
	18.	2.45	1.007
	Total	2.41	1.055

Table 2 indicates concerns, with mean values below 3.0 for all aspects. While pronunciation scores (M=2.638 ±.982) surpass writing (M=2.432±.992) and understanding (M=2.41±1.055), challenges persist. Notably, students excel in using pinyin for unknown characters (item 2, M=2.87, SD=0.907) but struggle with writing, exhibiting frequent typos (item 6, M=2.20, SD=1.08). Teachers emphasize weak understanding (M=2.41±1.055), particularly in single character comprehension (item 11, M=2.46, SD=1.01) and understanding similar characters (item 12, M=2.43, SD=1.045). Although contextual understanding is relatively better (item 13, M=2.51, SD=1.041), overall understanding remains insufficient, notably in poetry and reading materials (item 14, M=2.32, SD=1.064). Further issues arise in expressing ideas using characters (items 15-17), with challenges in practical problem-solving (item 17, M=2.3, SD=1.081). Questionnaire results indicate inadequate mastery of Chinese character rules (item 10), hindering their application to pronunciation and writing (items 4 and 12). Despite challenges, students are willing to seek help when facing difficulties (items 5, 9, and 18).

The findings indicate an urgent need to help students grasp Chinese character rules as a foundation for learning. Enhancing writing accuracy and aesthetics, improving comprehension of individual and similar characters, and strengthening reading skills are essential. Additionally, fostering students' ability to apply learned knowledge in real-life problem-solving is crucial.

Descriptive Findings on Teaching Strategies Used

Table 3. Results of Strategies used by Primary School Chinese Teachers

Construct	Item	M	SD
Situation Creation	1.	3.11	0.834
	2.	2.48	1.053
	Total	2.795	0.9435
Problem-Solving	3.	2.47	1.041
	4.	2.54	1.055
	5.	2.58	1.093
	6.	2.62	0.994
	7.	2.37	1.038
	Total	2.516	1.0442
Network Resources Used	8.	2.18	1.026
	9.	3.08	0.819
	10.	2.30	0.987
	Total	2.52	0.944
Cooperative Learning	11.	2.70	0.991
	12.	2.38	0.969
	13.	2.45	0.94
	Total	2.51	0.967

continued

Gamified Learning & Cognitive Visualization	14.	2.98	0.989
	15.	2.49	1.011
	Total	2.735	1.0

Table 3 reveals that teachers commonly employ situation creation (item 1, M=3.11, SD=0.834) and gamified teaching (item 14, M=2.98, SD=0.989) for lower-grade students. However, the created situations are less grounded in reality (item 2, M=2.48, SD=1.053). In terms of problem-solving strategies, while teachers encourage students to speak freely (item 6, M=2.62, SD=0.994), they allocate minimal effort to problem design, often presenting out-of-context problems (items 3-5). Moreover, targeted evaluation of students' answers is lacking (item 7, M=2.37, SD=1.038). Although teachers commonly use the Internet for lesson preparation (item 9, M=3.08, SD=0.819), they pay insufficient attention to sifting resources (item 10, M=2.30, SD=0.987), which may not effectively aid students in understanding and mastering Chinese characters (item 8, M=2.188, SD=1.026). Group cooperation and discussion are popular teaching methods (item 11, M=2.7, SD=0.991), yet seat adjustments and recognition/allocation of student roles in cooperative learning require improvement (items 12 and 13).

The results highlight the need to enhance teachers' ability to create real-life scenarios and context-based problem-solving questions. Evaluations should be more targeted and personalized. Teachers must also refine their use of online resources for lesson preparation and improve resource management. Additionally, effective role allocation and seating arrangements in cooperative learning require greater attention.

Descriptive Findings on Multimedia Resources Used

Table 4. Results of the Use and Management of Multimedia Resources

Construct		Item	M	SD
General Principle	1 Multimedia principle	1.	2.65	1.10
		2.	2.27	1.019
		Total	2.46	1.0595
Reducing Extraneous Processing	2 Coherence principle	3.	2.36	0.980
		4.	2.50	1.038
	3 Signaling principle	5.	2.62	1.067
		6.	2.48	1.002
	4 Redundancy principle	7.	2.94	0.98
		8.	2.35	1.000
		9.	2.31	0.902
		10.	2.57	0.761
	5 Spatial contiguity	11.	2.36	0.931
	6 Temporal contiguity	12.	2.42	0.983
		Total	2.491	0.965
Managing Essential Processing	7 Segmenting principle	13.	2.31	1.026
	8 Pre-training principle	14.	2.23	1.039
	9 Modality principle	15.	2.40	1.057
		16.	2.54	1.052
		Total	2.37	1.043
Fostering Generative Processing	10 Personalization principle	17.	2.32	1.016
		18.	2.51	1.023
		19.	2.50	1.044

continued

	11 Voice principle	20.	2.42	1.008
		Total	2.44	1.023

Table 4 reveals inadequacies in teachers' use of multimedia resources, with mean scores below 2.5 across four sub-sections. While teachers can effectively present multimedia materials combining text and images (item 1, M=2.65, SD=1.10), they struggle to find suitable pictures to pair with text (item 2, M=2.27, SD=1.019), indicating a gap in implementing basic principles of multimedia design. Teachers excel in reducing extraneous processing (M=2.403 ± 0.978) and fostering generative processing (M=2.44±1.023) but face challenges in managing essential processing (M=2.29±1.049). Notably, teachers emphasize key points through coloring and arrows (item 5, M=2.62, SD=1.067) but overlook consistency between prepared materials and teaching content (Item 3, M=2.36, SD=0.98). There's a preference for checking before teaching (Item 4, M=2.5, SD=1.038). Teachers show misunderstandings of the redundancy principle (item 7, M=2.94, SD=0.98). While presenting key phrases is preferred over large text paragraphs (items 9 and 10), spatial contiguity and temporal contiguity principles are evident in items 11 and 12. Managing essential processing sees a preference for pictures with text explanation over oral narration (items 15 and 16). In fostering generative processing, teachers excel in providing personalized materials but underutilize a personal approach using "I" and "you" in multimedia materials (item 17, M=2.32, SD=1.016).

The results underscore the need for teachers to master multimedia design principles, focusing on finding appropriate materials, ensuring consistency, and enhancing engagement through personalized approaches.

DISCUSSION

Issues of Students' Performance

For answering the first research question, the findings paint a comprehensive picture of the challenges primary school students face in mastering Chinese characters. Despite students demonstrating proficiency in pronunciation, issues arise when it comes to translating this knowledge into accurate writing, with frequent typos being a notable concern. The issues presented in this study are consistent with the findings of Lin, Lim and Wu's study (2022), which demonstrated that approximately 54.4% of errors made by lower-grade students in Chinese character learning are related to character shapes (typos). Other than that, the results of this study also reveal that teachers draw attention to the inadequacies in students' understanding of single characters and similar characters, calling attention to a critical gap in their foundational comprehension. From the researchers' point of view, an intervention tool like module is a viable means to help students.

These results reveal an essential problem found by this study, that is, students' lack of mastery of Chinese character rules hinders their application in pronunciation and writing. According to Chinese ancient scholar Xu Shen, the importance of form in explaining the original meaning of characters and the form-sound side was highlighted to elucidate the sounds of characters (Lu, 2002). Establishing a mutual connection between sound, form, and meaning is essential in learning Chinese characters, considering that characters embody the unity of these three aspects (Guo & Guo, 2021). Recognizing this, Lin et al. (2022) advocate for a reinforced emphasis on Chinese character instruction in lower-grade primary schools, particularly focusing on the teaching of Chinese character components. This targeted approach is envisioned to enhance students' understanding of Chinese characters by cultivating a holistic understanding of sound, form, and meaning in character learning.

Contextual understanding, while relatively better, still falls short, especially in dealing with poetry and reading materials, which is consistent with the statement from Huang (2021), who pointed that being out of context or real situation is not conducive to students' understanding of the meaning of Chinese characters. It is necessary to create the complexity of the real situation, make the situation have the depth of recreating the situation, and induce students to think deeply (Guo, 2019). What's more, expressing ideas through characters poses challenges, with a significant struggle observed in practical

problem-solving. However, the results also show that it is encouraging to note that students express a willingness to seek help when faced with difficulties.

These findings underscore the pressing need for intervention to address fundamental character rules, enhance writing skills, and deepen students' understanding of characters. Additionally, fostering students' real-life problem-solving skills based on their acquired knowledge is imperative. The discussion points toward a comprehensive approach to Chinese character education that extends beyond rote learning, emphasizing active engagement and practical application to ensure a more holistic mastery of the language, eventually reach deeper learning.

Issues of Teaching Strategies Used

For RQ 2, the findings reveal a prevalent inclination among teachers towards employing situation creation and gamified teaching, fostering an increased interest in Chinese character learning among students. However, the lack of real-world relevance in the created situations, potentially impacts students' practical understanding of Chinese characters. This results in line with the findings found out by Huang (2021) who emphasized that the importance of context or real-life situations on students' grasp of the meaning of Chinese characters.

Moreover, regarding problem-solving strategies, while teachers encourage student participation, there seems to be a disconnect as problems often lack contextual relevance, which emphasizes the significance of being in the context. Chen (2022) also stressed life-oriented teaching in Chinese character education, integrating real-life contexts to enhance students' adaptability. Furthermore, the deficiency in targeted evaluation of student responses is indicative of a broader issue – teachers' teaching methods lag behind in fostering students' 21st-century skills (Liu, 2020). This suggests that teachers need to focus on designing contextually relevant problems for effective problem-solving.

Furthermore, the survey indicates a widespread use of the Internet for lesson preparation, but there is insufficient emphasis on selecting and managing online resources effectively. Such neglect could contribute to students facing challenges in understanding and mastering Chinese characters. This aligns with the findings of Al-Ajmi and Aljazzaf (2020), who noted that current teachers lack the required knowledge and skills, as well as limited time. The findings suggest the importance of teacher training in resource selection and management for enhancing student learning outcomes.

In the context of group cooperation and discussion, while popular, there's room for improvement in seat adjustments and the recognition and allocation of roles. The importance of roles in group discussions has been highlighted in previous studies. Fujimoto (2016) suggested a hierarchical system for classifying essential roles in group discussions, which can enhance members' behaviors. Huang et al., (2018) proposed the adoption of functional roles to improve communication skills in group discussions, with a focus on the influence of these roles on participants' perceptions. While, the importance of seating position in facilitating group interaction and leadership emergence cannot be ignored (Greenberg, 1976). Addressing these aspects can significantly enhance the effectiveness of cooperative learning strategies.

Thus, teachers need to enhance their skills in creating contextually relevant situations and problem-based questions connected to real-life scenarios. Deep learning in Chinese character instruction requires students to move beyond memorization and actively engage in analyzing character structures, making meaningful connections, and applying knowledge in varied contexts. Additionally, teachers should improve their selection of online resources and refine cooperative learning strategies (e.g., role allocation and seating arrangement) to foster Chinese character deep learning through critical thinking, collaboration, and higher-order cognitive engagement.

Issues of Multimedia Resources Used

In this section, teachers' performance in using multimedia resources, including strengths and weaknesses, was discussed to answer the third research question. Relevant multimedia design principles to support improvement suggestions and best practices were introduced.

From the perspective of reducing processing, the present study indicated a commendable ability among teachers to integrate text and images in multimedia materials. However, the struggle to find suitable pictures paired with text (item 2) points to a potential gap in applying basic principles of

multimedia design. The challenge of finding suitable pictures paired with text in multimedia design is a significant issue, as highlighted by Johnson and Nemetz (1998). The oversight in maintaining consistency between materials and teaching content underscores a potential gap in instructional design, which adheres to Dai and Yang (2022), they found that in the teaching of Chinese characters, some teachers merely present Chinese characters in the form of images, sounds, videos or animations without any reasonable rules and just serves to convey educational content. This suggests a need for targeted support or training for educators in selecting and incorporating visuals that enhance instructional materials. Teachers' performance is commendable on the emphasis on key points through coloring and arrows, which conforming to signaling principle. As Highlighting, shading, coloring, or pointing out essential information cues learners, making it easier for them to recognize and facilitating improved learning (Rudolph, 2017; Mayer, 2021).

Additionally, while presenting key phrases is preferred over large text paragraphs, the findings highlight a misunderstanding of the redundancy principle, suggesting the importance of professional development opportunities focused on multimedia design principles. According to Rudolph (2017), the principle asserts that a screen should not contain both graphics, narration, and printed text simultaneously, as Mayer (2021) suggests that learners benefit more from the combination of graphics and narration alone.

In terms of managing basic cognitive processing, teachers showed a clear preference for using text explanations rather than verbal narration combined with images. This goes against the modality principle, which believes that people learn better from graphics and narration than from graphics and printed text, according to Mayer (2021). For the generative processing dimension, the personalization principle which believes that learn better when content is delivered in the style of dialogues or discussions between two or more people using pronouns (I, you) to personalize (Mayer, 2017), but this study showed that teachers' performance has both good and bad aspects. Teachers outperformed in customising materials to individual needs than in incorporating 'I' and 'you' personal approaches to utilising multimedia content.

Based on the above analysis, the effective use of multimedia resources in Chinese teaching practice needs to focus on the three dimensions of reducing extraneous processing, managing essential processing, and promoting generative processing. Although the teachers' practical performance has certain strengths, such as using the signal principle to enhance learners' attention, there are obvious deficiencies in the application of the modality principle and the redundancy principle. In addition, in the dimension of generative processing, although teachers can adjust the materials in an individualized way, they lack the mastery of personalized dialogue style. Therefore, it is recommended that teacher training should guide teachers to fully master Mayer's cognitive processing theory in an overall manner, and provide systematic practical cases to achieve a deep integration of theory and teaching practice and improve the effect of multimedia-assisted teaching.

CONCLUSION

This study analyzed the current issues of Strategies and Multimedia Integration in Chinese Character Deeper Learning, highlighting both the challenges faced by students and the strategies and multimedia employed by teachers. The findings reveal gaps in students' mastery of Chinese character structures, contextual understanding, and problem-solving skills, underscoring the need for instructional approaches that foster deep learning. Additionally, while teachers actively incorporate multimedia resources, issues related to contextual relevance, instructional design, and resource management indicate areas for further progress.

To enhance the effectiveness of Chinese character education, it is essential to integrate strategies that promote deeper cognitive processing, meaningful engagement, real-world application, and proper use of multimedia. Professional development programs focusing on multimedia design principles and pedagogical strategies could support teachers in optimizing their instructional practices. Training should emphasize the effective use of multimedia tools, the creation of contextually relevant learning environments, and the formulation of problem-based tasks that enhance cognitive engagement.

Although these insights are valuable, this study still has some limitations. First, the sample size is limited to a specific region and educational background, which may limit the generalizability of the

findings. Therefore, future studies can include participants from different regions, different educational stages, or diverse cultural backgrounds to improve the representativeness and external validity of the research results. Second, the study captured only a snapshot of current practices rather than long-term effects. Future research could employ longitudinal or experimental designs to assess the sustained impact of instructional strategies and multimedia integration on students' deep learning outcomes. Third, the study focused primarily on identifying issues and analyzing current practices without implementing or testing specific interventions. Future studies may explore the design, development, and empirical evaluation of instructional approaches—such as newly developed modules—that aim to enhance students' deep learning of Chinese characters. Ultimately, this study advances the discourse on the effective integration of multimedia in Chinese character instruction, laying a foundation for promoting deep learning of Chinese characters, enhancing instructional efficiency, and fostering pedagogical innovations aligned with the demands of 21st-century education.

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Appendix A

Questionnaire

Part B: Students' mastery of Chinese characters as observed by teachers	
No.	**Statement**
1	Most of my students have mastered the rules of pinyin.
2	Most of my students can use pinyin to pronounce unknown Chinese characters.
3	Most of my students are able to pronounce the correct syllables when reading Chinese characters.
4	Most of my students know that some Chinese characters can be pronounced through the components of characters.
5	Most of my students will solve the problem of Chinese characters they cannot read by asking their classmates or teachers, or looking them up in the dictionary themselves.
6	Most of my students seldom make typos.
7	Most of my students showed good shape and structure when writing Chinese characters.
8	Most of my students are able to write in the correct order of strokes when writing Chinese characters.
9	When students encounter a word they cannot write, most of them will solve it by asking their classmates or teachers, or by looking up the dictionary by themselves.
10	Most of my students know the structure and characteristics of Chinese characters (i.e., *Liushu*).
11	Most of my students are able to accurately identify and distinguish Chinese characters that look similar.
12	Most of my students can guess the meaning of unknown Chinese characters by identifying their radicals.
13	When my students read Chinese characters, most of them can understand the meaning of Chinese characters according to the context.
14	Most of my students are able to read easy materials (like Children's poems, children's songs, ancient poems, children's newspapers, etc.) and understand the main points.
15	Most of my students can use the correct Chinese characters to express their thoughts and opinions.
16	Most of my students are able to apply the Chinese characters they have learned to real life and show good semantic understanding.
17	Most of my students can correctly use the knowledge of Chinese characters they have learned to solve problems encountered in daily life.
18	I have observed that when students encounter Chinese characters that they do not understand, most of them will solve it by asking their classmates or teachers, or by looking up the dictionary by themselves.

Part C: The use of teaching strategies on Chinese characters teaching	
No.	**Statement**
1	I often use real scenarios (e.g. scenario of real life or scenario of story) to show the practical application of Chinese characters.
2	I often create real situations for students to **practice** the use of Chinese characters.
3	I often formulate questions carefully.
4	I often provide students with open-ended questions that encourage them to think deeply and explore various aspects of Chinese characters.
5	The questions I provide for my students are often about real life situations.
6	I often encourage students to speak up and feel free to ask.

7	I can make targeted evaluations and feedbacks of students' answers.
8	I often provide a variety of resources, such as pictures, videos, etc., which really help students better understand and master Chinese characters.
9	I use Internet resources a lot in my lesson preparation.
10	When using Internet sources, I often carefully sift through what they offer.
11	I often use group discussions in my Chinese character teaching classes.
12	When using group discussions, I often relocate students to arrange them into different groups.
13	In group work, I often emphasize the role division of students, and each group member plays a different role and assumes different responsibilities.
14	I often use the game method to stimulate students' interest in learning Chinese characters.
15	I often use visualizations like mind maps.

Part D: The use of multimedia technology in Chinese character teaching	
No.	**Statement**
1	I often use the combination of text and pictures (two elements of multimedia), and present them to students with PPT.
2	I frequently take the initiative to find suitable pictures and match them with text for teaching Chinese characters. (Frequency)
3	I often pay attention to and reduce the complex, repetitive, redundant or irrelevant text, pictures or audio that appear in my PPT production process.
4	I often spend time and energy checking whether the text, pictures or audio in the PPT that will be used for teaching are consistent with the teaching content.
5	I often use highlighted shading, coloring, arrows, etc. to emphasize key features of Chinese characters or points of knowledge that require attention.
6	I often use advance titles or keywords to preview important concepts or information that is about to appear.
7	I believe that combining more than two multimedia elements such as text, pictures, audio, and video in teaching can help students better understand the shape and meaning of Chinese characters.
8	I often present text, pictures, audio, etc. (more than two elements of multimedia) to students at the same time.
9	When I use pictures of the evolution of Chinese characters to explain the evolution process of Chinese characters, I often present **large paragraphs** of relevant text to assist in the explanation.
10	When I use pictures of the evolution of Chinese characters to explain the evolution of Chinese characters, I often present **key phrases** to assist the explanation.
11	I often put Chinese characters and related illustrations or diagrams on the same screen, close to each other rather than far apart (spatially).
12	I often present text and graphic material consecutively (temporal contiguity) without long intervals between presentations.
13	I often break down the Chinese character learning content into small units or different stages so that students can gradually digest, understand and master the pronunciation, shape and meaning characteristics of Chinese characters.
14	Before starting to teach a new character, I often use pictures, audio or other multimedia materials to introduce some relevant pre-knowledge and background information to students and offer related exercises.
15	In Chinese character teaching, I often show pictures and explain through oral narration.
16	In Chinese character teaching, I often show pictures and explain through text.
17	I often use a personal approach by using the pronouns "I" and "you" to bring in students' personal experiences and observations in the situations created, allowing students to have emotional engagement and a deeper learning experience.

18	In Chinese character teaching, I often provide personalized teaching materials based on students' Chinese character learning levels and needs.
19	In Chinese character teaching, I often pay attention to students' learning progress to adjust the learning progress and difficulty.
20	When guiding students to read, I often provide students with recordings of real human voices rather than computer-generated machine voice materials.