



A Study of the Effects of an Instructional Model Based on Cognitive Theory and a Task-Based Learning Approach on Enhancing Chinese Character Writing Skills of Primary School Students

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Abstract

This research consists purposes were 1. to compare the Chinese character writing skills between an experimental group taught using an instructional model based on cognitive theory and task-based learning and a control group taught using traditional methods and 2. to compare the pretest and posttest results within both groups. This study was a quasi-experimental design. The participants were 100 fifth-grade students from a school in Xinle City during the second semester of 2023, cluster random sampling assigned them to experimental and control groups (50 students each). The research instruments included (1) eight cognitive and task-based lesson plans (16 hours) (2) eight traditional lesson plans (16 hours) and (3) a Chinese character writing test administered before and after the intervention. Data were analyzed using mean, standard deviation, frequency, percentage, the Shapiro-Wilk test, the paired-sample t-test, independent-sample t-test and Cohen's d. The findings revealed that the experimental group significantly outperformed the control group on the posttest ($t = 7.732$, $p < .001$, $d = 1.56$). Both groups showed improvement after the intervention, but the experimental group demonstrated a greater effect size ($d = 2.95$) compared to the control group ($d = 0.97$). The instructional model not only improved students' fluency and accuracy in writing Chinese characters but also enhanced their understanding of stroke order and structure. These results affirm the effectiveness of cognitive and task-based strategies in promoting meaningful, skill-based learning.

Keywords: Cognitive, Task-based Learning, Chinese Writing Skills



Introduction

Chinese characters, which had originated from oracle bone script, reflected China's rich cultural heritage. Studies had revealed significant learning challenges among primary students, with 40% having struggled with stroke order (China Youth Research Center, 2018), while 50% had lost interest due to poor teaching methods (Zhang & Liu, 2020). Insufficient practice was identified as a key contributor to writing difficulties (Shanghai Educational Science Research Institute, 2019), which highlighted the need for more effective instructional approaches.

To address these challenges, the government had implemented policies to promote writing skill development. The Ministry of Education of the People's Republic of China (2002) had emphasized the cultivation of good writing habits, proper posture, and accuracy in both pen and brush writing. The Chinese language curriculum was structured into four core areas, with character writing having been categorized under reading and writing.

Chinese scholars had proposed various teaching methods to enhance character learning. Yao (2024) suggested integrating character sound, shape, and meaning with images and sounds to stimulate memory. A 2025 study confirmed that using context and longer exposure improved memory accuracy. Zhejiang Normal University Group (2022) recommended using picture books to demonstrate character evolution, while Hu (2023) developed a "character principle guessing" activity. Pan (2022) introduced life-based tasks that connected movement with brushwork.

Recent advances in educational psychology had demonstrated the importance of multi-sensory learning in character acquisition. Researchers found that linking visual, auditory, and kinesthetic cues significantly enhanced memory retention. This approach had aligned with the principle of embodied cognition, where physical movement and sensory stimulation reinforced abstract knowledge.

The integration of digital tools had transformed character learning methodologies. Studies showed that interactive writing applications and gamified platforms provided effective feedback and encouraged practice. Students who used these systems demonstrated higher accuracy levels compared to those using traditional methods alone.

Finally, the socio-cultural dimension of character writing had been recognized as essential. Writing practice was more than a technical skill—it embodied cultural values that were deeply rooted in Chinese tradition. Educators who incorporated cultural narratives into instruction found improved student engagement and cultural appreciation.



The Purposes

1. To compare the Chinese character writing skills after the experiment between the experimental group and control group.
2. To compare the changes in Chinese character writing skills after the experiment within the experimental group and control group.

Literature Review

This study developed and evaluated an instructional model to address primary students' difficulties in writing Chinese characters. The learning-centered approach connects new information with prior knowledge through meaningful tasks, enhancing understanding and improving character writing while offering insights into related educational challenges.

Cognitive theory forms the foundation of this research, focusing on psychological learning processes including perception, attention, memory, discussion, and problem-solving (Anderson, 2010). The theory positions learners as active participants constructing knowledge by integrating new information with existing cognitive structures (Reigeluth, 1983). Piaget's (1972) stages of cognitive development - sensorimotor, preoperational, concrete operational, and formal operational - demonstrate how learning effectiveness corresponds to developmental phases. Ausubel's (1968) meaningful learning theory and Bruner's (1960) concepts of spiral curriculum and scaffolding further inform the instructional approach, emphasizing the importance of aligning educational activities with students' cognitive structures and developmental stages.

The research incorporates task-based learning, a constructivist approach emphasizing knowledge acquisition through meaningful tasks. Originating from Prabhu's Bangalore Project, this method replaced traditional grammar instruction with problem-solving exercises in language learning. Willis (1996) developed the approach into a three-stage model comprising task design/preparation, execution, and post-task reflection. Applied to Chinese writing instruction, this framework reduces cognitive stress and improves fluency through scaffolded tasks ranging from information exchange to creative writing activities.

Writing skills in this study are defined according to Chinese educational standards and academic research. The National Education Commission (1997) identifies writing methods, style, form, techniques, error correction, and speed as essential components, while the Chinese Character Writing Test Outline (Ministry of Education, 2016) emphasizes standardization and norms. Li (2016) highlights the importance of proper structure, spacing, and stroke order, and Wang (2022) contributes spatial balance techniques through top-bottom and left-right



character scaffolds. These combined perspectives inform the study's operational definition of Chinese writing skills as encompassing stroke order, structural layout, spacing, neatness, and adherence to standardized forms.

Methodology

This study employed a quasi-experimental design to evaluate the effectiveness of the instructional model integrating cognitive theory and task-based learning approach. The research methodology consisted of the following steps

1. The population and sample: The population comprised fifth-grade students from five classrooms (approximately 50 students per class), each with varying knowledge and abilities. Using G*Power 3.1 for an a priori power analysis (Faul et al., 2009), a minimum of 74 participants was required to detect a significant effect with an effect size of 0.85, significance level of 0.05, and power of 0.95

The sample was selected using cluster random sampling, with each classroom treated as one cluster. One classroom was randomly assigned as the experimental group, taught using cognitive theory and task-based learning approach. Another classroom served as the control group, taught using traditional teaching methods. The design of this study can be illustrated as follows

Groups	Pretest	treatment	posttest
E	O ₁	X	O ₃
C	O ₂	-	O ₄

2. Research Instruments: The instruments employed in this study were as follows

2.1 Lesson plans based on the instructional model integrating cognitive theory and task-based learning (8 lesson plans × 120 minutes, total 16 sessions).

2.2 Lesson plans based on traditional teaching methods (8 lesson plans × 120 minutes, total 16 sessions).

2.3 A scoring rubric for assessing students' Chinese character writing skills.

3. Data Collection: Data collection followed five main steps

3.1 Preparation of lesson plans for both experimental and control groups.

3.2 Administration of pretests to assess prior knowledge.

3.3 Implementation of lessons according to the designated instructional methods.

3.4 Administration of posttests to evaluate students' Chinese character writing skills.

3.5 Classroom observations and reflective notes recorded throughout the teaching sessions.



4. Data Analysis: The collected data were analyzed using both descriptive and inferential statistics

4.1 Descriptive statistics: mean, standard deviation, frequency, and percentage.

4.2 Inferential statistics: Normality Test: Shapiro-Wilk test. Within-Group Comparison: Paired-sample t-test to compare pretest and posttest scores. Between-Group Comparison: Independent-sample t-test to compare posttest scores between groups. Effect Size: Cohen's d to determine the magnitude of differences.

5. Statistical Methods Used in the Study: The statistical analyses were conducted using statistic software to analyze. The methods included: Descriptive statistics: Mean, Standard Deviation, Frequency, Percentage. Shapiro-Wilk test for normality. Paired-sample t-test for within-group comparison. Independent-sample t-test for between-group comparison. Cohen's d for effect size.

Results

The findings of this study can be summarized in accordance with the research objectives as follows

1. Comparison of the Chinese character writing skills after the experiment between the experimental group and control group

The researchers examined the Chinese character writing skills acquired by the experimental group using cognitive theory and task-based learning approach, and the control group using the traditional teaching method, as follows

Firstly, the SPSS program was analyzed using the Shapiro-Wilk method of normality test ($n < 50$). The findings showed that the data were normally distributed since every p value was higher than 0.05. Consequently, it can be concluded that the data set satisfies the assumptions needed for further statistical analysis.

After the experiment, the researchers compared the experimental and control groups' Chinese character writing skills. Table 1 displays the analysis's finding.

The above data showed that in the Chinese writing character skill test, the experimental group, which was taught using the instructional model using cognitive theory and task-based learning approach, performed significantly higher than the control group, which was taught using the traditional teaching method ($t = 7.732$, $p < .001$). According to the calculated effect size of Cohen's $d = 1.56$, this instructional model significantly improves students' Chinese character writing skills.

Additionally, the findings indicated that this instructional model enhances students' writing fluency and accuracy in Chinese characters while also helping them comprehend stroke order, radical structure, and spatial organization. These methods can increase student engagement, develop cognitive processes, and enhance writing skills through the use of structured tasks, cognitive strategies, and interactive activities.

Table 1 Comparison of the experimental and control groups’ posttest scores

Topics	Prescriptive	Between-subject analysis	
	Statistics		
	Posttest mean (SD)	t-value (p-value)	Effect size
Chinese character writing skills			
Experimental group	68.93 (5.54)	7.732 (<.001)	1.56
Control group	60.06 (5.81)		

The researchers plotted the students’ post-test scores in a comparative chart, which is displayed below, to help illustrate these differences.

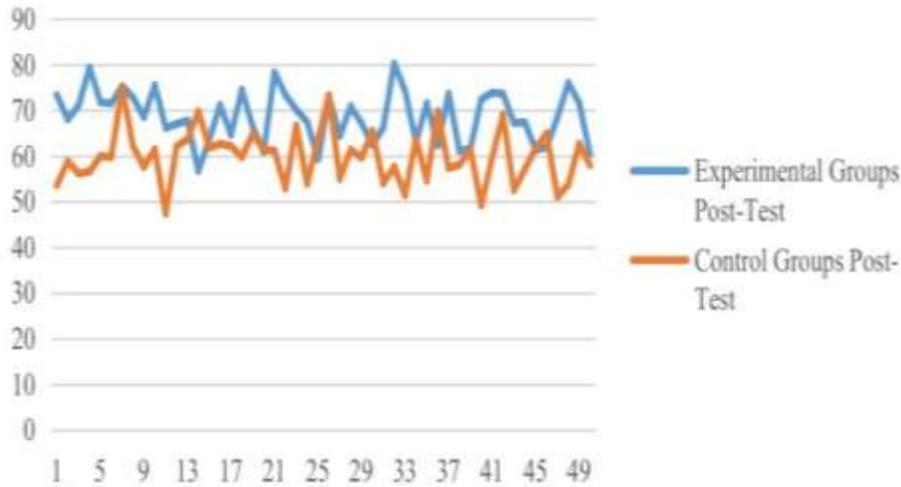


Figure 1 Comparison of the experimental and control groups’ posttest scores in Chinese character writing skills

Furthermore, as illustrated in Figure 2, the researcher plotted the students’ improvement scores in Chinese character writing skills between the experimental and control groups.

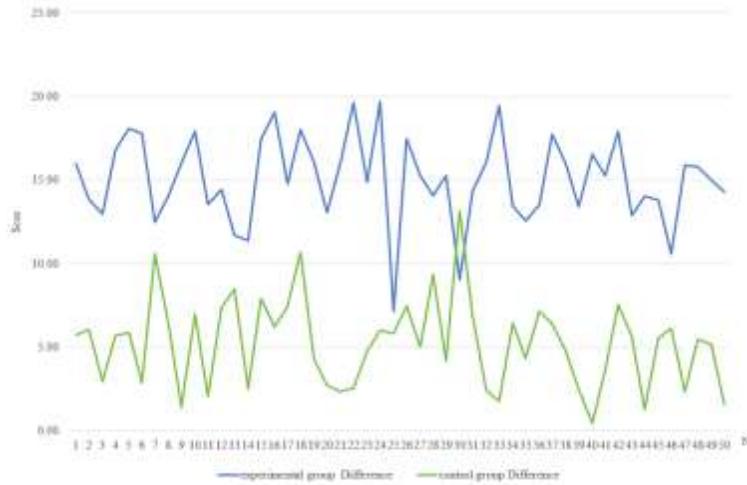


Figure 2 Comparison of the experimental and control groups’ improvement scores in Chinese character writing skills

2. Comparison of the changes in Chinese character writing skills after the experiment within the experimental group and control group

The researcher compared pretest and posttest scores for the Chinese character writing skills test in the experimental and control groups after the instruction. The results are shown in Table 2.

Table 2 Comparison of the experimental and control groups’ pretest and posttest scores

Topics	Prescriptive statistics		Within-subject analysis		
	Pretest mean	Posttest mean	t-value	rxy	Effect sizes
	(SD)	(SD)	(p-value)		
Experimental group					
Chinese character writing skill	53.87 (4.62)	68.93 (5.54)	40.58 (<.001)	2.62	2.95
Control group					
Chinese character writing skill	54.80 (5.03)	60.06 (5.81)	13.85 (<.001)	2.68	0.97

*Statistically significant at the .05 level

According to a comparison of pretest and posttest scores within each group, both the experimental and control groups demonstrated statistically significant improvements in Chinese character writing skills at the .05 level. Nonetheless, the experimental group, which was taught using cognitive theory and task-based learning approach, showed a significantly higher improvement than the control group ($t = 13.85, p < .001, rxy = 2.68,$

effect size = 0.97; $t = 40.58$, $p < .001$, $r_{xy} = 2.62$, effect size = 2.95). The experimental group's very large effect size suggests that the developed instructional model significantly outperformed traditional teaching method in enhancing students' skill to write Chinese characters.

As shown in Tables 2 and 3, the researchers plotted comparative graphs out of the students' pretest and posttest scores to better depict the differences.

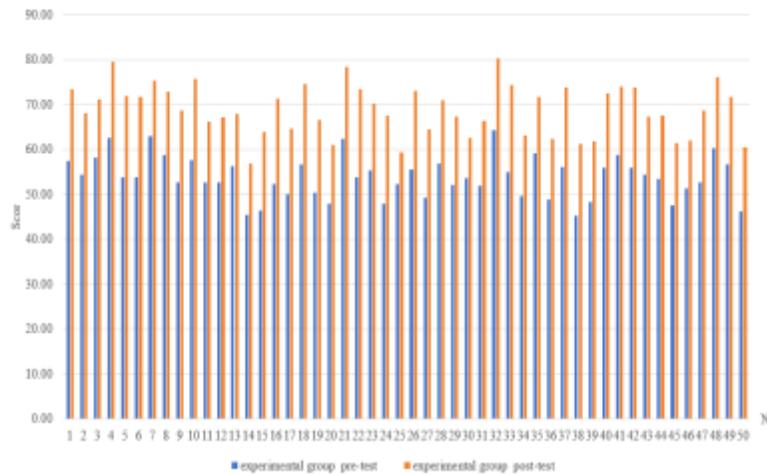


Figure 3 Comparison of the pretest and posttest scores for the experimental group

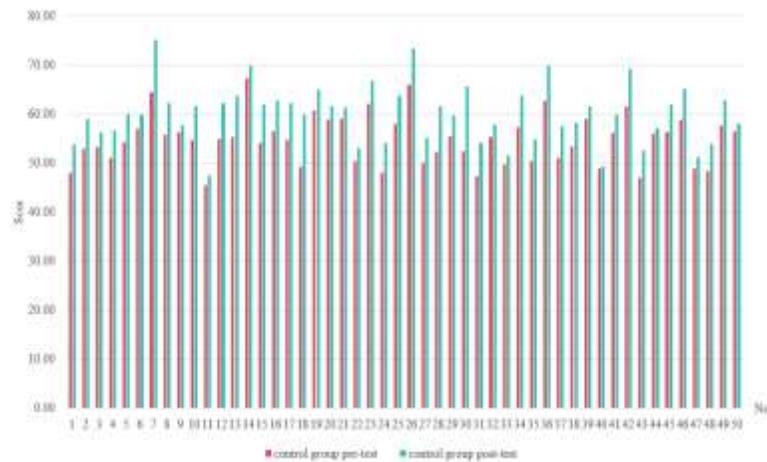


Figure 4 Comparison of the pretest and posttest scores for the control group

Based on the research findings, the developed instructional model using cognitive theory and task-based learning has been applied in the school context to enhance students' Chinese character writing skills. Teachers have incorporated structured tasks, interactive activities, and cognitive strategies into regular lessons, which have resulted in higher engagement, improved writing fluency, and better comprehension of stroke order and



character structure. Moreover, the evidence from this study has been shared with school administrators to support curriculum planning and teacher training, emphasizing modern teaching methods over traditional approaches. For policy makers, these results provide empirical support for promoting active learning and cognitive-based instructional models in Chinese language programs, demonstrating that such approaches can effectively improve student outcomes and should be considered in national or regional curriculum guidelines.

Conclusion

This research, the researcher can summarize the results of the study according to the following purposes: The experimental group taught using the cognitive theory and task-based learning approach demonstrated significantly higher Chinese character writing skills in the posttest compared to the control group taught with the traditional method, confirming the effectiveness of the instructional model.

Both the experimental and control groups showed significant improvement from pretest to posttest; however, the experimental group exhibited a greater improvement, indicating that the cognitive and task-based approach was more effective in enhancing students' Chinese character writing skills.

Discussions

The researcher discussed the findings of this study as follows

The posttest results indicated that the experimental group had significantly higher scores in Chinese character writing compared to the control group. The experimental group's scores improved significantly from the pre-test (mean = 53.87, SD = 4.62) to the post-test (mean = 68.93, SD = 5.54), according to within-group analysis. The effect size (Cohen's $d = 2.95$) was categorized as a very large effect, and the t -value was 40.58 ($p < 0.001$). These align with the objectives of the study, which are to examine the effectiveness of cognitive theory and task-based learning approach. The results confirm the core tenet of cognitive theory, which holds that meaningful engagement and organized mental processing can greatly improve learning outcomes (Piaget, 1972). It also shows how effective task-based learning is at creating an engaging learning environment that helps students develop significant skills (Willis, 1996). Additionally, blending mobile-assisted tools, like the Xiezi application, into Chinese character instruction greatly enhanced learners' writing performance and stroke-order accuracy, surpassing traditional pen-and-paper methods, according to Zhou & Li (2022). The results show that technology-enhanced, task-based learning approaches can help primary school students learn how to write Chinese characters. Students in the experimental group further support the idea that instructional model based on cognitive theory promotes more meaningful learning than rote memorization, as they showed an easier time



mastering character structures through repeated practice in practical exercises. This is consistent with Piaget's theory of cognitive development, which stresses meaningful and gradual advancement. Additionally, Xu et al. (2021) demonstrated that using a sequential, multimodal scaffolding approach in Chinese character instruction greatly improved students' writing and recognition skills, demonstrating the value of cognitive scaffolding techniques in fostering literacy development.

However, since they may have an effect on the outcomes, factors like the learning environment and each student's readiness must also be taken into account.

Findings or New Knowledge

This study found that the experimental group, which was taught using cognitive theory combined with a task-based learning approach, significantly outperformed the control group taught by traditional methods in Chinese character writing skills, demonstrating a large effect size. Both groups showed significant improvement in their writing skills after the instruction; however, the experimental group exhibited markedly greater progress, confirming the effectiveness of the instructional model used.

The instructional model not only enhanced students' writing fluency and accuracy but also improved their understanding of stroke order and the structural components of Chinese characters better than the traditional teaching method. Furthermore, integrating technology and task-based learning fostered a more meaningful and engaging learning environment, consistent with cognitive development theories that emphasize gradual and meaningful learning processes.

Nevertheless, external factors such as the learning environment and individual student readiness may have influenced the outcomes, and these should be considered to maximize the effectiveness of future instruction.

Recommendations

1. Recommendations for Application

The following recommendations are put forth for the application of the developed instructional model in light of the findings

1.1 Schools and educators should implement an instructional model that integrates cognitive theory with task-based learning, stressing the realism of task design, the systematicity of cognitive engagement, and students' active participation, in order to enhance Chinese character writing skill of students.



1.2 Teachers should incorporate a variety of learning resources, including interactive educational games, visualizations of Chinese character structures, and stroke-order animations, to spark students' interest, help them better understand character structures, and hit their admiration.

1.3 The design of classroom activities ought to emphasize peer evaluation, group collaboration, and supported writing tasks in order to enhance students' writing fluency and motivation for learning.

1.4 Including ongoing formative assessment into instruction and giving students specific feedback will enable students to track their development and make plans for the long-term growth of their writing skills.

2. Recommendations for Future study

The following recommendations are made for further study in order to broaden the findings of this study:

2.1 Future study should examine how this instruction model is applied with students at various educational levels, including upper-grade students, and how well it adapts to traditional brush-writing instruction.

2.2 In order to assess the long-term impacts of the developed instructional model, such as the sustainability of writing ability and the transfer of writing skills to new contexts, longitudinal studies are recommended.

2.3 Future study should examine how to improve personalized learning and hasten the development of writing skills by integrating adaptive learning technologies, such as automated error analysis systems or AI-based writing assistants.

2.4 Future study should examine various writing assignments, such as creative and problem-solving writing assignments, to determine which task design best fosters the growth of students' Chinese character writing skills.

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