THE EFFECT OF AN INSTRUCTIONAL MODEL USING CONSTRUCTIVIST THEORY AND PROBLEM-BASED LEARNING APPROACH TO ENHANCE CHINESE READING AND WRITING ABILITIES OF PRIMARY SCHOOL STUDENTS IN CHINA

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Abstract

The purpose of this research was to study the effectiveness of the instructional model using constructivist theory and problem-based learning approach with 1) compare the Chinese reading and writing abilities after using an experiment between the experimental and control group; 2) compare the Chinese reading and writing abilities before and after using an experiment within the experimental group and the control group. The sample groups were two classrooms of 50 sixth-grade students per classroom selected by cluster random sampling from the Affiliated Primary School of Jilin Normal University in second semester of the academic year 2023, one class was selected as an experimental group to learn by the instructional model using constructivist theory and a problem-based learning approach, and the other class was selected as a control group to learn by traditional methods. The research instruments included: 1) 6 lesson plans using the instructional model using constructivist theory and a problem-based learning approach; 2) a 50-item Chinese reading ability test; and 3) a 1-item Chinese writing ability test. Research was conducted on the experimental group learning by the instructional model using constructivist theory and a problem-based learning approach, spending 24 periods, and the control group learning by traditional methods, spending 24 periods (pretest and posttest are not included). The research results provided:

1. The students in experimental group had Chinese reading and writing abilities posttest score higher than the control group.

2. The students in experimental group and control group had Chinese reading and writing ability scores on posttest are higher than pretest.

Keywords: Constructivist Theory, Problem-Based Learning Approach, Chinese Reading and Writing Abilities, Instructional Model

Introduction

The Chinese government prioritizes modernizing education to enhance students' reading and writing abilities. The National Education Reform Plan (2010-2020) and Chinese Curriculum Standards promote independent thinking and lifelong learning (Ministry of Education, 2022). While national surveys in 2023 show improved reading rates among minors aged 0-17, challenges persist in primary schools, where reading and writing development remains complex.

Chinese reading and writing skills are essential for students' development, yet many struggle with them, challenging the education system. Regional disparities, parental education, and gender differences contribute to these difficulties (Chen & Chen, 2020). Surveys show primary students struggle with understanding composition and structuring writing, highlighting the need for improved instruction.

To address these challenges, educational researchers are exploring innovative teaching methods aligned with modern learning theories. Constructivist and problem-based learning (PBL) approaches offer promising frameworks for enhancing reading and writing skills. Constructivist focuses on learners actively building knowledge through interaction, while PBL engages students in solving real-world problems to develop critical thinking and language skills (Zhang et al., 2020). These methods improve reading interest, learning efficiency, teamwork, and independent thinking.

Given the current state of Chinese language education and the benefits of constructivist and problem-based learning approaches, this study aims to develop and evaluate an instructional model that integrates these theories to enhance primary students' reading and writing abilities. The model promotes engagement, critical thinking, problem-solving, collaboration, and self-directed learning. This research contributes to improving Chinese language education and offers insights for regions facing similar literacy challenges.

Research objectives

To study the effectiveness of the instructional model using constructivist theory and problem-based learning approach:

1. Compare the Chinese reading and writing abilities after using an experiment between the experimental and control group.

2. Compare the Chinese reading and writing abilities before and after using an experiment within the experimental group and the control group.

Literature review

Constructivist Theory in Education

Constructivist theory in education posits that learners actively build knowledge through interaction with their environment (Loyens & Gijbels, 2008). It has two main branches: Piaget's cognitive constructivism and Vygotsky's social constructivism. Piaget focuses on individual knowledge construction through assimilation and accommodation, emphasizing student-centered learning and discovery (Mollon et al., 2021). Vygotsky, however, highlights social interaction in learning, introducing concepts like the Zone of Proximal Development and scaffolding. Both theories see children as active knowledge constructors. In Chinese language education, constructivism can improve reading and writing skills through practical tasks and fostering independent learning strategies.

Problem-Based Learning Approach in Education

Problem-Based Learning (PBL) is an inquiry-based instructional approach originating in medical education in the 1950s, with Howard Barrows introducing it at McMaster University in 1969. PBL emphasizes student-centered, problem-oriented learning to enhance problem-solving, collaboration, and self-directed learning skills (Brown, 1997). Defined as a method where students gain knowledge by exploring real-world problems (Buck Institute for Education), PBL promotes active over traditional learning. Its key features include critical thinking, creativity, and collaboration (Ali, 2019). In Chinese language education, PBL enhances reading and writing skills by integrating practical activities, fostering problem-solving abilities, and encouraging independent learning.

Chinese Reading and Writing Abilities

Chinese reading and writing abilities are vital in primary education, influencing students' academic performance and future development. Reading ability includes skills like literal comprehension, reorganization, inference, and evaluation (Clymer, 1968), shaped by factors such as family environment, language proficiency, and motivation. Writing ability involves language expression, organization, logical thinking, and revision skills (Heaton, 1998). Factors like age, gender, and educational approaches affect both abilities. Constructivist theory and problem-based learning enhance these skills by encouraging active participation and critical thinking. Effective assessment using tools like Barrett's Taxonomy and Response Writing Rubric helps improve teaching practices and student growth.

Conceptual framework

Organizing learning activities using the instructional model using constructivist theory and problem-based learning approach is developed from the concepts of teaching and learning using constructivist theory according to Piaget and Vygotsky, and the problem-based learning approach according to Sardar Ali (2019), Broadbent et al. (2018), and Maastricht University (2013). This model aims to enhance the Chinese reading and writing abilities of primary school students, as shown in Figure 1.

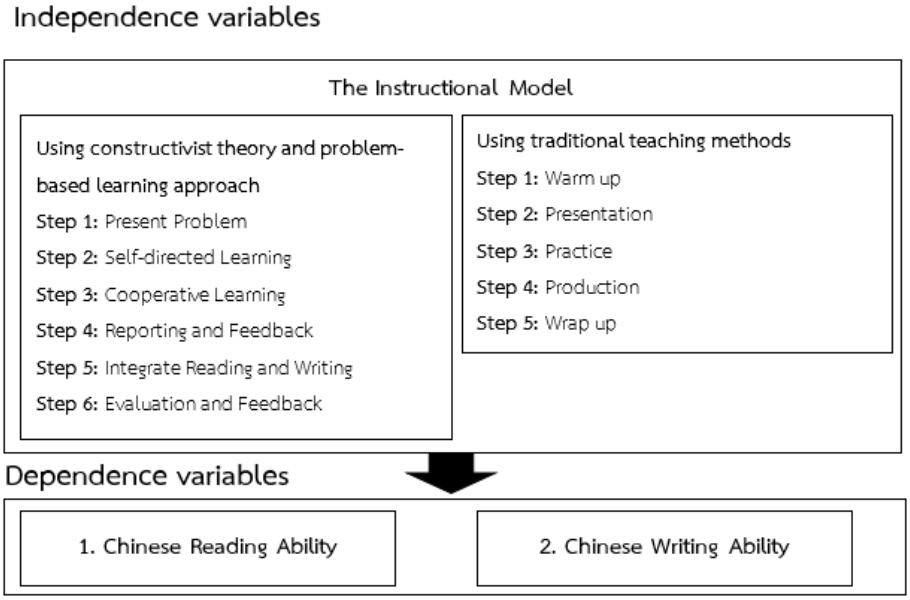

Figure 1 Conceptual framework

Research methodology

Population: The population in this study consisted of six classrooms of sixth-grade students, totaling 300 students from Jilin Normal University Affiliated Primary School, enrolled in the second semester of the 2023 academic year.

Samples: A priori power estimates were calculated using G*Power 3.1. Assuming an effect size of .60, an alpha of .05, and a beta of .80, the power analysis indicated that 72 participants would be sufficient to detect significant effects. From 300 sixth-grade students across six classrooms, two were randomly chosen using Cluster Random Sampling. One classroom, with 50 students, was assigned as the experimental group using the instructional model using constructivist theory and problem-based learning approach. The other, also with 50 students, was assigned as the control group, following traditional methods.

Instruments: 1) Lesson plans using the instructional model, had an average appropriate value of 4.99 for the entire version, indicating the highest suitability level.

2) The Chinese reading ability test had an Index of Item Objective Congruence (IOC) value of 0.80-1.00, a difficulty value of 0.42-0.58, a discrimination value of 0.36 or higher, and a reliability value of 0.96.

3) The Chinese writing ability test had an IOC value of 0.80-1.00, a difficulty value of 0.71, a discrimination value of 0.40, and a reliability value of 0.92.

Data Collection: The data collection process is divided into two groups as follows:

1. Experimental Group

1.1 The researcher introduces herself and orients students about the learning management using the instructional model. Then, the researcher conducts a pretest using the Chinese reading ability test and the Chinese writing ability test created by the researcher. The test results were recorded and compared with the posttest scores.

1.2 The researcher implemented the instructional model with the experimental group. This involves 6 lesson plans, with each plan consisting of 4 units, totaling 24 periods. The details are shown in Table 1.

Table 1 Unit Topics and Duration of Teaching Chinese Reading and Writing Abilities

Unit Topic	Lesson	Time (minute)
Unit 1	**Lesson 1:** Step into Ancient Customs	160
Folk Customs	**Lesson 2:** Reflecting Ancient Customs	160
Unit 2	**Lesson 1:** Walking into the Masterpiece	160
Great Books of Foreign Literature	**Lesson 2:** Learning how to read	160
Unit 3	**Lesson 1:** Listening to Writers' Moods	160
Express genuine feelings	**Lesson 2:** Explore the methods of expression in the text	160
Total	**6**	**960**

1.3 After completing all 6 lesson plans, a posttest is administered to the experimental group, and the results are recorded.

2. Control Group

2.1 The researcher introduces herself and orients the students about the learning management using traditional methods. Then, the researcher conducts a pretest using the Chinese reading ability test and the Chinese writing ability test created by the researcher. The test results were recorded and compared with the posttest scores.

2.2 The researcher conducted the learning activities using traditional methods created and controlled by the researcher.

2.3 After implementing the traditional methods, a posttest was administered to the control group, and the results were recorded.

Data Analysis: 1) The quality of the instruments was analyzed using the IOC, difficulty (p), discrimination (r), and reliability using the Statistical Package for the Social Sciences (SPSS).

2) The comparison of students' Chinese reading and writing abilities after the experiment between the experimental group and the control group was analyzed using One-Way MANOVA.

3) The comparison of students' Chinese reading and writing abilities before and after the experiment within the experimental group and control group were analyzed using a paired sample t-test.

Results

1. The Results of Comparing the Chinese Reading and Writing Abilities of Primary School Students After Using the Instructional Model Using Constructivist Theory and Problem-Based Learning Approach Between Experimental Group and Control Group

The researcher calculated the assumption of Normal Distribution using the Kolmogorov-Smirnov formula in SPSS. The p-values obtained for the data were all greater than .01, indicating that the data were normally distributed. The equality of variances was confirmed, with Box's M value of 5.528, F value of 1.802, and p-value of .144, suggesting no significant difference in the overall variance of the dependent variables. For Chinese reading ability, the analysis showed an F value of .765 and p-value of .384, while for Chinese writing ability, the F value was .460 and p-value was .499. These results demonstrate that the variances were not significantly different. Therefore, it can be concluded that the variances of the dependent variables were consistent and suitable for further analysis.

Table 2 Results of Posttest Scores on Chinese Reading and Writing Abilities Between Experimental and Control Groups

Multivariate Test			
Statistical Test	**Value**	**F**	
Wilk's Lambda	.708	20.026*	
Univariate Test			
Dependent Variables	**Type III Sum of Squares**	**Mean Square**	**F**
Chinese Reading Ability	696.960	696.960	24.809*
Chinese Writing Ability	225.000	225.000	20.474*

* $p < .01$ level

From Table 2, it was found that the results of the comparison of Chinese reading and writing abilities the overall approach, classified by the instructional model among primary school students using the constructivist theory and problem-based learning approach, compared with traditional methods, yielded an F value of 20.03 (calculated from Wilks' Lambda) with a p-value of < .01. This result indicates a significant impact of the instructional format on the dependent variables, Chinese reading and writing abilities, at a statistical significance level of .01.

For Chinese reading ability, the comparison between the instructional model and traditional methods showed an F value of 24.81 and a p-value of < .01. This suggests that the format of teaching and learning activities significantly influences Chinese reading ability, with the instructional model having a more substantial impact than traditional methods.

Similarly, for Chinese writing ability, an F value of 20.47 and a p-value of < .01 were noted when comparing the instructional model with traditional methods. These results confirm that the teaching and learning activities format significantly affects Chinese writing ability, with the constructivist theory and problem-based learning approach having a more pronounced effect than traditional methods.

2. The Results of Comparing the Chinese Reading and Writing Abilities of Primary School Students Before and After the Experiment Within the Experimental Group and the Control Group. The research results are shown in Tables 3.

Table 3 Comparison of Primary School Students' Chinese Reading and Writing Abilities Before and After Using Constructivist and Problem-Based Learning Compared to Traditional Methods

Samples		Prescriptive Statistics		Within-Subject Analysis			Correlation	Effect Size
		Pretest Mean (SD)	Posttest Mean (SD)	Mean Difference (SD)	SE Difference	t-Value		
Chinese Reading Ability	Experimental (n=50)	30.48 (5.86)	41.50 (5.49)	11.02 (2.54)	.35856	30.73*	.834	3.35
	Control (n=50)	29.04 (5.70)	36.22 (5.11)	7.18 (2.93)	.41472	17.31*	.858	2.45
Chinese Reading Ability	Experimental (n=50)	18.08 (3.83)	25.52 (3.04)	7.44 (2.12)	.300	24.81*	.902	4.36
	Control (n=50)	16.60 (3.32)	22.52 (3.57)	5.92 (1.85)	.262	22.63*	.858	3.20

* $p < .01$ level

From Table 3, data revealed that the experimental group using the instructional model showed significant improvements in Chinese reading and writing abilities. Initially, the average Chinese reading ability score for the experimental group was 30.48, with a standard deviation of 5.86. Post-instruction, this score increased to 41.50, with a standard deviation of 5.49. The calculated t-value stood at 30.73, the effect size was 3.35, and the correlation coefficient was 0.83. In terms of Chinese writing ability, the pre-instruction average was 18.08 with a standard deviation of 3.83, escalating to 25.52 with a standard deviation of 3.04 post-instruction. The t-value for this was 24.81, with an effect size of 4.36 and a correlation coefficient of 0.90.

Conversely, students taught using traditional methods exhibited lesser improvements. Their pre-instruction Chinese reading ability average was 29.04 with a standard deviation of 5.70, rising to 36.22 with a standard deviation of 5.11 after learning, yielding a t-value of 17.31, an effect size of 2.45, and a correlation coefficient of 0.86. Chinese writing scores were similarly modest; starting at 16.60 with a standard deviation of 3.32 and improving to 22.52 with a standard deviation of 3.57 post-learning. This resulted in a t-value of 22.63, an effect size of 3.20, and a correlation coefficient of 0.86.

The study underscores that the experimental group, using the instructional model, demonstrated more substantial gains in both reading and writing abilities compared to the control group using traditional methods. Both the reading and writing improvements in the experimental

group were statistically significant at a level of .01, marking the instructional model's greater overall impact on development.

Discussion

1. The Results of Comparison on Chinese Reading and Writing Abilities After Learning by the Instructional Model Using Constructivist Theory and Problem-Based Learning Approach Between Experimental and Control Groups.

MANOVA analysis showed significant effects of the instructional model on dependent variables (Wilks' Lambda: $F = 20.02$, $p < .01$), highlighting notable differences in Chinese reading and writing abilities between experimental and control groups. For reading, there was a significant group-by-repeated-measures interaction ($F = 24.81$, $p < .01$), with the experimental group exhibiting higher mean differences, correlations ($r = 0.90$ vs 0.86), and effect sizes ($d = 4.36$ vs 3.20) than the control group. Writing ability showed similar trends ($F = 20.47$, $p < .01$), indicating a stronger impact of the new teaching method in the experimental group.

The instructional model using constructivist and problem-based learning approach, was more effective than traditional methods in enhancing Chinese reading and writing abilities. This aligns with Vygotsky's social constructivism, which stresses the importance of social interaction in cognitive development, advocating that social and cultural factors influence intellectual growth and emphasizing the social construction of knowledge through authentic experiences and learner-centered instruction. This practical approach, which balances individual and group work, markedly improved the experimental group's language skills (Piaget, 1976; Vygotsky & Cole, 1978; Ali, 2019; Broadbent et al., 2018; Maastricht University, 2013).

Consistent with prior research, Hilmawan et al. (2022) found that a constructivist-based literacy environment significantly enhanced students' literacy skill. Similarly, Rianti et al. (2024) reported that problem-based learning greatly improved reading comprehension of narrative texts, with average scores increasing significantly across cycles. These results underscore the potential benefits of integrating such instructional models to substantially enhance students' reading and writing abilities.

2. The Results of Comparison on Primary School Students' Chinese Reading and Writing Abilities Before and After Using Constructivist Theory and Problem-Based Learning Approach Compared to Traditional Methods.

The findings of this study underscore that instructional models grounded in constructivist theory and problem-based learning (PBL) significantly boost primary school students' Chinese reading and writing skills compared to traditional methods. Constructivist theory, as developed by Piaget and Vygotsky, highlights the active role of learners in shaping knowledge through interactions with their environment and peers (Piaget, 1976; Vygotsky & Cole, 1978). This framework complements PBL, which immerses students in real-world problem-solving scenarios, thereby enhancing cognitive engagement and skill acquisition (Barrows, 1986).

In this study, the experimental group, instructed through constructivist and PBL approaches, exhibited notable enhancements in reading and writing abilities versus the control group, which followed conventional teaching methods. Specifically, the experimental group's average reading scores escalated from 30.48 to 41.50, and writing scores from 18.08 to 25.52, demonstrating significant effect sizes of 3.35 and 4.36 respectively. These results affirm the effectiveness of learner-centered methodologies in promoting academic growth.

The success of these instructional models can be attributed to several factors: They encourage active learning, where students construct understanding through exploration and inquiry. This notion aligns with Vygotsky's Zone of Proximal Development theory, which posits that learning is optimal when students tackle tasks slightly beyond their current capabilities (Vygotsky & Cole, 1978). Moreover, the collaborative aspect of PBL underscores Vygotsky's emphasis on social interaction as vital for cognitive development.

Supporting these observations, prior research, such as studies by McVie and Dunsmore (2016) and Savery and Duffy (1995), has demonstrated similar benefits from constructivist and PBL methods, including enhanced reading skills and improved engagement.

In conclusion, the significant gains in Chinese reading and writing skills seen in the experimental group validate the superiority of constructivist and PBL strategies over traditional teaching. These findings advocate for educators to integrate these approaches to enrich student learning outcomes. Future studies could delve into the long-term effects of these models and their generalizability across various disciplines and educational levels.

Body of knowledge

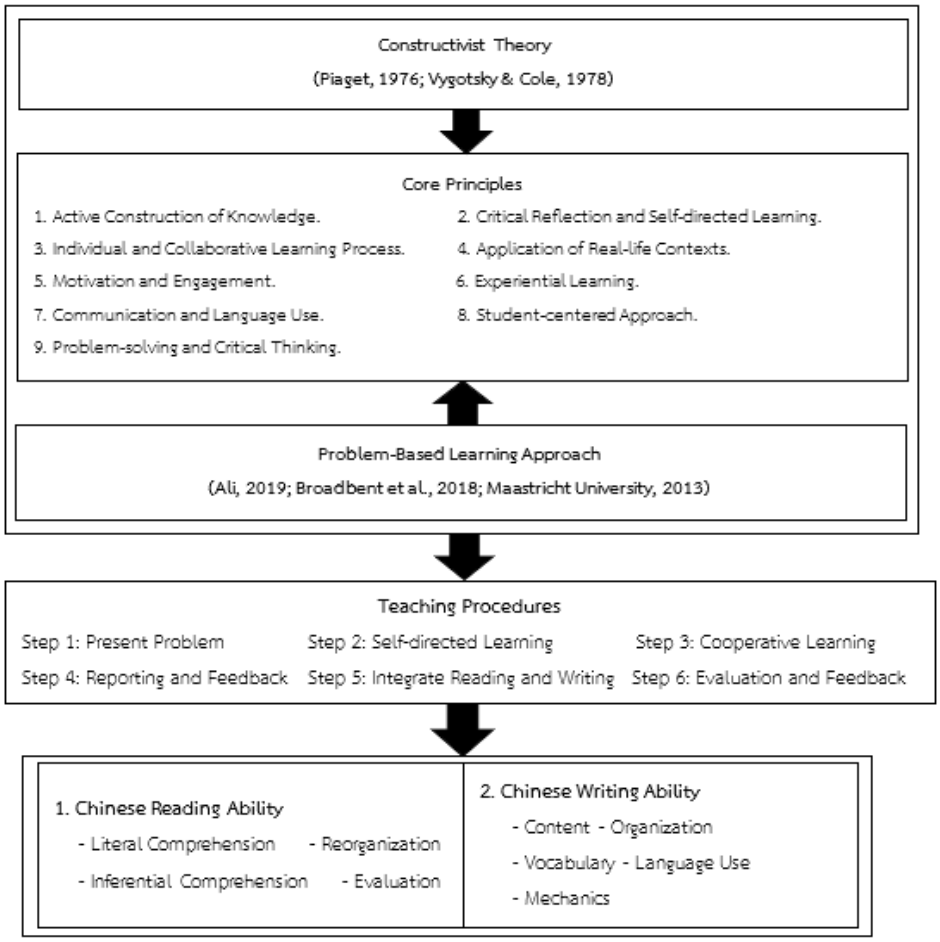

Figure 2 Organizing Teaching Activities Using the Instructional Model

Figure 2 shows that using the instructional model to teach Chinese reading and writing not only enhanced these skills but also provided students with opportunities to learn collaboratively. This method allowed students to draw solutions from community resources, connecting new knowledge with prior experiences to foster diverse understanding. Consequently, students improved their problem-solving abilities, engaged in questioning, and pursued self-directed learning, effectively applying these skills in daily life.

Conclusion

The results of the trial were divided into two sections as follows:

1. Comparing the Chinese Reading and Writing Abilities of Primary School Students After the Experiment Between the Experimental Group and the Control Group.

1.1 Reading Ability: Repeated measures MANOVA indicated a significant interaction between the group and repeated measures ($F = 24.809$, $p < .01$). The experimental group showed a higher mean difference in scores compared to the control group. The correlation ($r = .902$) and effect size ($d = 4.36$) were higher for the experimental group.

1.2 Writing Ability: There was a significant interaction between the group and repeated measures ($F = 20.474$, $p < .01$). The experimental group had a significantly higher mean difference in pretest and posttest scores than the control group, with higher correlation and effect size values, indicating greater consistency and influence of the new instructional model.

The instructional model using constructivist theory and problem-based learning approach significantly enhanced the Chinese reading and writing abilities of primary school students. The experimental group outperformed the control group, demonstrating the model's effectiveness.

2. Comparing The Chinese Reading and Writing Abilities Before and After Using an Experiment Within the Experimental Group and The Control Group.

The Chinese reading and writing test results showed that the post-test scores of the sixth-grade students in the experimental group were higher than those in the control group.

2.1 Reading Ability

- Experimental group: Pre-test mean score 30.48 (S.D. = 5.86), post-test mean score 41.50 (S.D. = 5.49), t-Value 30.734, correlation .834, effect size 3.35.

- Control group: Pre-test mean score 29.04 (S.D. = 5.70), post-test mean score 36.22 (S.D. = 5.11), t-Value 17.313, correlation .858, effect size 2.45.

2.2 Writing Ability

- Experimental group: Pre-test mean score 18.08 (S.D. = 3.83), post-test mean score 25.52 (S.D. = 3.04), t-Value 24.810, correlation .902, effect size 4.36.

- Control group: Pre-test mean score 16.60 (S.D. = 3.32), post-test mean score 22.52 (S.D. = 3.57), t-Value 22.629, correlation .858, effect size 3.20.

These results were statistically significant at the .01 level.

Suggestion

From the research results the researcher has suggestions as follows:

1. **Suggestions for Application**

1.1 Effective implementation of instructional models in Chinese language teaching requires comprehensive teacher training and professional development. This includes workshops on pedagogies and techniques, strategies for engaging learning, and a mentoring system to support transition from traditional methods.

1.2 To optimize Chinese language curriculum, schools should integrate constructivist theory and problem-based learning, developing culturally relevant materials and resources. A bank of real-world scenarios, projects, and collaborative activities, along with interactive strategies, can enhance engagement and personalize learning.

2. Suggestion for future research

2.1 Future research should conduct a longitudinal study to assess the long-term effects of the instructional model on Chinese reading and writing skills, tracking the same students over several years to determine if improvements are sustained and impact overall academic performance and language proficiency in later grades.

2.2 Future research could explore a cross-cultural comparative study, applying this instructional model in various countries or regions where Chinese is taught as a second language. This would assess the model's effectiveness across different cultural contexts and educational systems, offering insights for adaptation in diverse learning environments.

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