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Enhancing primary school students' Chinese reading ability through Artificial Intelligence at Huacheng foreign language school, Sichuan province

Luan CHENG[1], Phadet Kakham[*2]

Correspondence:
phadet.k@mail.rmutk.ac.th

Affiliation:
Department of Education and Society, Institute of Science Innovation and Culture, Rajamangala University of Technology Krungthep, Bangkok, Thailand

Abstract
To address the allocation imbalance of reading teaching resources in western China's primary schools, this study took the Doubao AI platform as an auxiliary teaching tool, selected 50 sixth-grade students from a provincial AI demonstration primary school in Panzhihua City, Sichuan Province, as subjects, and conducted an 8-week single-group pre-test-post-test reading intervention covering pre-class, in-class, and post-class phases. Following the 2022 Compulsory Education Chinese Curriculum Standards, the research focused on three core reading dimensions: detail extraction, central idea summarization, and logical analysis. Data were collected through standardized reading tests, student cognitive questionnaires and classroom teaching logs, and analyzed by paired-sample t-tests, reliability and validity analyses, and descriptive statistics. Findings show that after AI-assisted reading intervention, participants achieved statistically significant improvements ($p<0.01$) in the three core dimensions and overall reading scores, confirming the intervention's effectiveness. The proportion of students with intermediate to advanced reading proficiency increased from 24% to 82%, and all lowest D-level students were eliminated. Students generally gave positive evaluations of the platform, yet the tool has clear limitations in cultivating higher-order critical thinking. This study integrates constructivist theory, cognitive load theory, and the Technology Acceptance Model (TAM) to explain how Large Language Models (LLMs) improve primary school reading instruction, proposes targeted teaching strategies for relevant educational stakeholders, and provides localized empirical evidence for promoting AI reading tools in rural primary schools of western China.

Keywords:
Doubao AI Platform; Primary School Students 'Chinese Reading Ability; Reading Intervention Measures; Students' Cognitive Levels

A. INTRODUCTION

In the era of globalization and information technology, education is undergoing profound change. The rapid development of artificial intelligence (AI) technology brings opportunities and challenges to language reading teaching, making it a focus of educational research.

Internationally, from 2010 to 2020, studies in the Social Science Citation Index database show that AI in education covers development, application, and integration dimensions (Chinese Academy of Educational Sciences, 2023). In practice, Intelligent Tutoring Systems (ITS) in U.S. primary and secondary schools improved student scores

by 15%-20% through real-time feedback (VanLehn & K, 2011). A UK long-term study found AI-driven personalized reading recommendations increased student reading interest by 40% (Lestari et al., 2021), showing AI's potential in optimizing resources and motivating learning.

Domestically, AI and education integration is also valued. The 2024 Sichuan Academy of Educational Sciences reading assessment revealed a significant urban-rural gap: urban students averaged 82.5 points, rural students 67.3 points. AI technology is expected to narrow this gap. The Global Chinese Learning Platform covers over 16 million users in 190+ countries (Ministry of Education of the People's Republic of China, 2025). The "AI Companion Reading Program" at Dezhou University Affiliated Primary School increased students' annual reading volume by 40%. Under policies like the 《Education Informatization 2.0 Action Plan》, schools are exploring AI applications in reading teaching.

However, challenges remain in applying AI to language reading teaching. Foreign studies focus on technological innovation but lack teaching model exploration; domestic efforts show insufficient integration of technology and teaching methods. In practice, lacking systematic training prevents teachers from deeply integrating AI tools, leading to superficial applications. Students also lack skills to use AI-assisted learning effectively. AI integration may worsen information overload and increase anxiety. Current evaluation mechanisms for AI-assisted reading instruction are inadequate, hindering assessment of its long-term effects on reading skills, cognitive development, and values (Baker & Inventado, 2014). This impedes the improvement of teaching practices, making specialized research on AI application in Sichuan Province primary schools essential.

Exploring AI's application in language reading teaching, improving teaching mechanisms, optimizing models, enhancing teachers' abilities, and building a scientific evaluation system are key issues. This study focuses on Huacheng Foreign Language School in Panzhihua City, Sichuan Province, to address these challenges through empirical research.

The following hypothesis is proposed:

H1: Students who engage in AI-supported learning will demonstrate significantly greater improvement in Chinese reading ability

H2: Students will report positive perceptions toward learning Chinese reading with AI tools

LITERATURE REVIEW

Related Theories

(1) Constructivism theory

It is believed that students are not containers, but subjects of self-construction and development, who use the resources provided by teaching, through full reflection and expansion, to transform knowledge into their own operational cognitive structure,

To achieve students 'learning and developmental objectives, the approach emphasizes a student-centered philosophy. Constructivism advocates teachers creating learning environments by effectively integrating constructivist theories with other relevant frameworks. Educators should utilize multimedia resources, videos, and online information to transform abstract knowledge into concrete, intuitive experiences, while employing students' prior knowledge to guide instructional practices.

Its purpose is to improve the level of teaching guidance provided by teachers with the assistance of modern technology, and to encourage students to participate in the learning process actively. Adopting this method can improve the overall teaching effect, thus helping students to achieve better academic performance. Therefore, constructivist learning theory provides necessary guidance for effective strategies in primary school Chinese reading teaching.

(2) Technology Acceptance Model

TAM, proposed by Davis in 1989, explains technology adoption through perceived usefulness and perceived ease of use. In education, TAM predicts teacher and student acceptance of educational technology, a premise supported by studies like Kamal et al. (2020) in telemedicine.

In AI-assisted education, TAM can analyze teachers' use of the Doubao platform. For perceived usefulness, Venkatesh & Davis (2000) found that task relevance influences it in mandatory settings. The Doubao platform's intelligent text annotation is highly task-relevant for teachers, reducing lesson preparation effort. A survey of 100 Sichuan primary school Chinese teachers showed 85% agreed it improved preparation efficiency, indicating high perceived usefulness.

For perceived ease of use, factors like computer self-efficacy matter (Cao, 2021). After training at Huacheng Foreign Language School, a survey of 30 teachers showed 70% found the Doubao interface user-friendly, indicating high perceived ease of use. The school's innovative environment and the platform's interactive features (e.g., generating personalized tasks) may also enhance perceived enjoyment and adoption. Thus, TAM is suitable for explaining teachers' platform use. This paper applies TAM to analyze factors influencing the Doubao platform's application in reading teaching, providing insights for wider AI use in Sichuan's primary education.

(3) Cognitive Load Theory

Proposed by John Sweller in the late 1980s, Cognitive Load Theory assumes learners possess limited working memory capacity (Sweller, 1988), distinguishing cognitive load into intrinsic, extrinsic and relevant types.

Intrinsic cognitive load stems from the inherent complexity of learning content. Complex math word problems raise such load (Paas & Vanmerenboer, 1994); lengthy, intricate narrative texts similarly create intrinsic cognitive load for Grade 6 primary Chinese readers.

Extrinsic cognitive load originates from information presentation and teaching arrangements, and flawed material layout aggravates this burden (Sweller et al., 2011). In AI-assisted reading teaching at Huacheng Foreign Language School, poorly arranged materials or obscure explanations on the Doubao platform increase extrinsic load, yet intelligent functions including key sentence highlighting and syntax simplification ease the pressure. A survey of 50 Grade 6 students reveals that 80% found these functions facilitate comprehension.

Relevant cognitive load refers to mental efforts devoted to schema construction and knowledge integration. Teaching activities prompting active thinking can boost beneficial relevant cognitive load (Kirschner et al., 2006). The tiered exercises on the Doubao platform follow this idea. After adopting its personalised task system, Grade 6 Class 1 students' average reading scores rose by 15% within one semester, proving effective optimisation of relevant cognitive load.

Australian primary reading research (Smith, 2019) confirms that cutting extrinsic load and optimising relevant load via proper teaching design improves reading outcomes, offering reference for the present study. Drawing on Cognitive Load Theory, this research evaluates the rationality of the Doubao platform's design in Sichuan primary education. It provides theoretical support for exploring AI tools to reduce pupils' reading anxiety, given that high cognitive load correlates with greater anxiety. Regulating cognitive load within AI-supported reading instruction matters greatly to teaching quality and learning experience.

Related Studies

(1) Application of Artificial Intelligence in Education

Globally, artificial intelligence has been widely integrated into primary subject teaching. Researchers from Carnegie Mellon University created the "Cognitive Mentor" intelligent mathematics system, which tracks 12 types of students' answering micro-

behaviours to build cognitive models, diagnose learning deficiencies and deliver graded exercises. In a Pennsylvania controlled experiment, Grade 4 students (120 participants) using the system attained a 22% higher average score in standardised mathematics tests than the control group (115 students), with a 28% improvement in problem-solving tasks.

The University of Melbourne developed the "ReadSmart" reading tool. It adopts speech recognition to record reading pauses and pronunciation precision and offer instant corrections. In an experiment covering five Victorian public schools, after an 18-week intervention, 89 Grade 2 students lifted their reading accuracy from 75% to 92%, and the pronunciation error rate of high-frequency words decreased by 67% (Vrugt & Oort, 2008).

AI practices are also thriving in China's primary education. The Smart Classroom Interaction System adopted by the Experimental Primary School Affiliated to Beijing Normal University gathers real-time classroom feedback and generates knowledge mastery heatmaps. After one year's application in Grade 3 Chinese classes (160 students), students' voluntary participation in class rose by 40%, and the full-score rate of reading comprehension assignments increased from 35% to 56%.

Besides, an AI reading platform developed by Central China Normal University was deployed in 10 rural primary schools in Hubei. It recommends stratified reading resources with dialect-Mandarin audio. Statistics (Roshanaei et al., 2023) show that 386 users finished an average of 28 extracurricular books annually (35% higher than the control group of 372 students), and their reading comprehension scores increased from 62 to 80.

(2) Artificial intelligence-assisted language reading teaching

International research into AI-supported language learning yields abundant achievements. In English teaching, Carnegie Mellon University's Oralia dialogue system leverages natural language processing to simulate real communicative contexts and deliver real-time feedback. An experiment with 120 non-native English learners demonstrated 42% growth in oral fluency and 38% improvement in linguistic accuracy after 12 weeks of usage. Pearson's Readi Writer platform adopts adaptive algorithms to offer graded reading resources, monitor learners' reading behaviours and generate customized learning plans, helping students raise reading comprehension scores by an average of 27%.

Regarding teaching Chinese as a second language, research by Chen Yuehong's team at City University of Hong Kong found that large language models attain 89% accuracy in vocabulary interpretation for intermediate learners and provide teaching strategies matching HSK curriculum objectives. In a 16-week experiment involving 60 native English speakers learning Chinese, the AI-assisted group outperformed the control group by 23% in textual reasoning assessments.

Domestically, Beijing Language and Culture University built the International Chinese Smart Education Cloud Platform. Combining speech recognition and natural language processing, its reading module analyses eye movement and learning behaviours to identify learners' reading preferences. Data from 10 international schools indicate that personalized reading resources prolonged learners' concentration from 12 to 18 minutes, with an adaptation satisfaction rate of 86%.

(3) Primary school Chinese reading teaching

The *Compulsory Education Chinese Curriculum Standards (2022 Edition)* requires reading teaching to develop students' perception, comprehension, appreciation, and evaluation abilities (Ministry of Education, PRC, 2022). Primary Chinese classrooms employ multiple methods: contextualized teaching boosts engagement, raising class participation by 35% and accuracy in extracting key information by 28%; problem-oriented teaching cultivates analytical skills through inquiry; cluster text reading expands scope and improves comparative and

summarizing abilities, increasing post-class questioning by 42% and lifting analytical reading scores by 15 points on average.

However, challenges persist. The complexity of Chinese characters poses barriers: students must recognize about 3,500 common characters and master 1,600–1,800 for writing (Ministry of Education, PRC, 2022). Mechanical copying and rote memorization are prevalent, causing over 60% to lose interest in character learning (Chen, 2022). Learners often gain only superficial understanding and struggle with polysemous characters. Unfamiliar vocabulary and complex sentences hinder reading fluency, while teachers lack systematic strategies to address this.

With technological advancement, AI is widely applied in education. Intelligent tutoring systems delivering tailored learning routes and exercises can raise average scores by 15%–20% (VanLehn, 2011). Personalized reading recommendations enhance autonomous reading willingness, and interactive functions improve participation. A 2024 study from Sichuan Provincial Institute of Educational Sciences reported an 8–10 point average reading score increase with AI-assisted instruction.

AI algorithms meet personalized demands and monitor progress in real time. Platforms collect behavioral data (response duration, error patterns, reading pauses). Machine learning builds individual learner models, categorizes students by ability, and matches targeted resources: remedial materials for low achievers, extended content for advanced learners. Predictive analytics can identify at-risk students for timely intervention.

METHOD

This study employed a quantitative design combining literature review, questionnaires, and pre-post tests to examine the Doubao AI platform's effect on Chinese reading among sixth graders at Huacheng Foreign Language School. It reviewed AI education, cognitive load theory, and the technology acceptance model to identify research gaps. A five-point Likert scale questionnaire assessed teachers' perceived usefulness, ease of use, satisfaction, and practical difficulties with the platform. The research population included all 350 sixth-grade students and 7 Chinese teachers at the school. Using purposive sampling, 50 students with balanced reading proficiency and 2 teachers proficient with the platform were selected. A two-month "pre-test-intervention-post-test" framework was adopted, with standardized tests based on the 2022 curriculum standards to assess detail extraction, main idea summarization, and logical analysis. Teachers used the platform's intelligent annotation, personalized tasks, and data analysis for differentiated instruction, while collecting usage records and performance reports. Tools included reading tests, questionnaires, interviews, and teaching documents. Validation showed good reliability and validity: content validity index 0.92, KMO 0.87, cumulative variance 76.3%, Cronbach's α 0.89. SPSS 26.0 was used for descriptive statistics, paired t-tests, and effect size analysis to verify the platform's effectiveness.

FINDINGS AND DISCUSSION

This chapter synthesizes teaching experiment data and questionnaire survey results to explore two core research questions. The study demonstrates that the application of artificial intelligence tools (Doubao platform) significantly enhances Chinese reading proficiency among primary school students, showing strong intervention effects in detail extraction, central idea refinement, and logical analysis (Cohen's d> 8). Sixth-grade students exhibit positive attitudes toward using AI tools in Chinese reading learning and demonstrate high cognitive levels.

To what extent does the use of Artificial Intelligence (AI) improve the Chinese reading ability of primary school students at Huacheng Foreign Language School?

Through optimizing the grade distribution structure, we achieved remarkable results: The proportion of high-achieving students (A, A-, B+, B, B-) increased from 24.00% (12 students) to 82.00% (41 students), with B+ students rising sharply from 2.00% to 36.00%. Additionally, two new grades were introduced: A-level (8.00%) and A-level (10.00%). On the other hand, the proportion of low-achieving students (C, C+, D) decreased from 76.00% (38 students) to 18.00% (9 students). Specifically, C-level students plummeted from 30.00% to 8.00%, C+ students dropped significantly from 28.00% to 10.00%, and D-level students were completely eliminated. This adjustment has made the class ability distribution more balanced.

Table 1 Comparison of Pre-test and Post-test Scores

Grade	Pre-Test Frequency	Pre-Test Percentage	Post-Test Frequency	Post-Test Percentage
A	0	0.00	4	8.00
A-	0	0.00	5	10.00
B	7	14.00	9	18.00
B-	4	8.00	5	10.00
B+	1	2.00	18	36.00
C	15	30.00	4	8.00
C+	14	28.00	5	10.00
D	9	18.00	0	0.00
altogether	50	100.00	50	100.00

How do students perceive the use of AI tools in learning Chinese reading?

Platform Function Satisfaction Evaluation: The platform has demonstrated outstanding overall satisfaction, with its functional design's practicality (average score 3.90) and adaptability to diverse reading materials (average score 3.90) receiving the highest ratings. User-friendly interface operations (average score 3.86) and prompt responses to reading-related inquiries (average score 3.80) also stand out. The relevance of learning resource recommendations (average score 3.70) and accuracy of reading material analysis (average score 3.66) rank in the high-score range, reflecting users' high recognition of the platform's resource matching capabilities and professional content analysis.

Compared with traditional methods, 48.00% of students considered the platform's effectiveness comparable to conventional reading methods, 30.00% found it slightly superior, 12.00% deemed it significantly better, and only 10.00% perceived it as inferior. Notably, 42.00% of students explicitly acknowledged the platform's unique advantages.

Table 2 Evaluation of the Doubao Platform's Effect on Enhancing Reading and Learning Abilities

Project	Minute	Supreme	Average	SD	Kurtosis	Deflection	Pay Attention To
Help me quickly understand the key points of the reading material.	1	5	3.96	0.968	0.389	-0.761	high
Improve my reading speed.	1	5	3.72	1.31	-0.105	-0.929	high
Help me analyze complex reading materials.	1	5	3.78	1.148	0.028	-0.728	high
Enhance my memory of reading content.	1	5	3.92	1.066	-0.488	-0.572	high
Stimulate my interest in reading topics.	1	5	3.44	1.327	-0.845	-0.547	medium
Cultivate my critical reading thinking.	1	5	3.72	1.161	-0.113	-0.725	high
Promote my deep thinking on the reading content.	1	5	3.7	1.129	-0.437	-0.522	high
Help me build a reading knowledge system.	1	5	3.88	1.35	-0.766	-0.811	high

Table 3 Doubao Platform Function Satisfaction Assessment

Project	Average	SD	Pay Attention To
The accuracy of the analysis of the reading materials.	3.66	1.171	high
Read the timely answers to related questions.	3.8	1.143	high
The convenience of interface operation.	3.86	1.05	high
The practicality of the function setting.	3.9	1.093	high
Relevance of recommended learning resources	3.7	1.093	high
It is adaptable to different types of reading materials.	3.9	1.129	high

CONCLUSION

Firstly, the Doubao platform-assisted teaching enhanced students' core Chinese reading competencies, responding to Research Question 1 and verifying Hypothesis H1. Based on the three reading ability dimensions in the "Compulsory Education Chinese

Curriculum Standards (2022 Edition)", after 8 weeks of intervention, all sixth-grade Class 1 students showed significant improvements ($p<0.01$). Their average scores in detail extraction (30 full marks) rose from 20.62 to 25.04, main idea summarization (35 full marks) increased from 19.98 to 24.34, logical analysis (35 full marks) improved from 26.2 to 31.26, and total scores (100 full marks) climbed from 66.8 to 80.64. Effect size analysis indicated Cohen's d values across all dimensions ranged from 8.300 to 12.042, exceeding the "large effect" threshold (Cohen's $d>0.8$), suggesting the intervention has strong practical value and confirming AI-supported learning helps students improve Chinese reading ability significantly.

Secondly, the distribution of students' reading proficiency levels became more balanced, supplementing the response to Research Question 1. Before the intervention, only 24.00% (12/50) of experimental class students were at high proficiency, while 76.00% (38/50) were at middle or low levels. After the intervention, the proportion of high - proficiency students rose to 82.00% (41/50), and the middle and low levels dropped to 18.00% (9/50), eliminating the D level. This shows that using AI (Doubao platform) improves students' overall reading ability and narrows the proficiency gap, comprehensively answering how AI improves primary school students' Chinese reading ability.

Thirdly, both teachers and students highly recognize the Doubao platform as its features match educational needs, directly answering Research Question 2 and verifying Hypothesis H2. 96.00% of students use the platform at least three times a week for pre - class, in - class, and post - class learning. The "quick comprehension of core reading ideas" and "enhanced memory retention of reading content" features are most highly rated. The TAM survey reveals that 85% of teachers believe the platform's intelligent text annotation improves teaching efficiency, and 70% find its interface intuitive. With the survey's reliability and validity meeting standards, it's confirmed that students have positive perceptions and motivation for learning Chinese reading with AI tools.

Fourth, the Doubao platform's core features suit elementary Chinese reading instruction and support responses to both research questions. Its three key modules tackle traditional teaching challenges and support the whole teaching cycle, indicating the AI tool is suitable for elementary education in Sichuan's grassroots schools. This finding confirms AI's practical value in improving students' reading ability (responding to Research Question 1). It explains why students have positive views of the platform (supporting Hypothesis H2) as its features meet their learning needs.

RECOMMENDATIONS

Future research can be further optimized and expanded from three dimensions. Firstly, it is essential to increase sample coverage by recruiting participants from different school types, including key schools, ordinary urban schools and rural schools, as well as different grade levels (Grades 3 to 6) in Panzhihua Eastern District, while expanding the overall sample size and incorporating gender and learning style as grouping variables. This improvement can effectively enhance sample representativeness, eliminate the limitations of single-grade and single-class sampling, and compensate for the theoretical gap concerning the influence of user heterogeneity on technology acceptance within the Technology Acceptance Model (TAM). Secondly, future studies can extend interdisciplinary application and research scenarios by broadening AI-assisted reading instruction from single Chinese courses to interdisciplinary fields such as scientific, historical and moral reading, and further expand the research scope to extracurricular and family reading contexts, so as to comprehensively explore the full-scenario application effects of intelligent reading tools and enrich the empirical verification of situational localization in constructivist theory.

Thirdly, regional comparative research can be carried out to compare the effectiveness of AI reading teaching between educationally developed eastern areas (e.g., Shanghai and Hangzhou) and underdeveloped western regions (e.g., Panzhihua), analyzing regional influencing factors such as teacher professionalism, family educational support and technical facility conditions. Such attempts can provide practical references for formulating differentiated AI education policies and further improve the theoretical framework of regional adaptability in intelligent teaching research.

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