International Conference on Economic Management and Intelligent Society (EMIS 2026)

Research on Strategies for Enhancing Chinese Language Literacy in Rural Basic Education from the Perspective of TPACK Theory Using Digital Dictionaries

Ling Xu, Shuyi Long, Jiamei Wang, Zunzhang Sun*
School of Humanities and Public Administration, Jiangxi Agricultural University, Nanchang, Jiangxi, China
**Corresponding Author*

Abstract: With the deep advancement of digital transformation in education, leveraging modern information technology to bridge the urban-rural education gap and enhance the core competencies of rural students has become a significant issue. As the foundation for students' comprehensive development, Chinese language literacy faces challenges such as resource scarcity and monotonous teaching models in rural basic education. Digital dictionaries, with their multimedia, interactive, convenient, and intelligent features, offer new tools and pathways to address this dilemma. This study aims to construct a strategy system for enhancing Chinese language literacy in rural basic education based on the Technological Pedagogical Content Knowledge (TPACK) framework. The paper first analyzes the current situation and deep-seated challenges of Chinese language literacy in rural basic education, pointing out that the current urban-rural education gap is shifting from infrastructure disparities to digital literacy gaps. Secondly, it systematically reviews the evolution, core characteristics, and educational application potential of digital dictionaries. Thirdly, grounded in TPACK theory, it deeply explores how Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK) can be organically integrated with digital dictionaries. Finally, from the four dimensions of content deepening, teaching innovation, technological empowerment, and ecological collaboration, the paper constructs a comprehensive strategy framework that includes specific implementation paths and guarantee mechanisms. The goal is to provide theoretical guidance and practical reference for the digital transformation of rural education, ultimately achieving the fundamental objective of empowering education through technology and promoting educational equity.

Keywords: Digital Dictionaries; Rural Basic Education; Chinese Language Literacy; TPACK Framework; Enhancement Strategies

1. Introduction

The wave of information technology is profoundly reshaping the production, dissemination, and reception of knowledge, bringing unprecedented opportunities for transformation in the education sector. Against this backdrop, digital dictionaries, as a modernized upgrade of traditional language reference books, have transcended simple query functions to evolve into comprehensive language learning platforms integrating multimedia presentation, intelligent interaction, and personalized learning. They not only fully inherit the authority and systematic nature of paper dictionaries but also, empowered by digital technology, achieve dynamic content updates, multimodal presentation, and instant interaction, opening up broader and more convenient spaces for language learning.

Chinese language literacy is the cornerstone of students' core competencies, encompassing multiple dimensions such as language knowledge, linguistic ability, thinking quality, aesthetic taste, and cultural identity. In the rural basic education system, enhancing Chinese language literacy holds fundamental and strategic significance for breaking the intergenerational transmission of poverty, promoting educational equity, and narrowing the urban-rural development gap. However, for a long time, China's rural basic education has faced structural dilemmas. On one hand, the distribution of high-quality educational resources

is uneven, with rural schools chronically lacking in books, audio-visual materials, and digital teaching resources [1]. On the other hand, the professional competence and stability of the teaching workforce are insufficient; some teachers' teaching concepts and methods remain entrenched in traditional exam-oriented education models, struggling to meet the demands of cultivating students' comprehensive competencies in the new era [2]. Furthermore, the investment and support from rural family education are relatively limited, and the linguistic environment and cultural atmosphere students are exposed to are relatively monolithic. These factors collectively constrain the comprehensive development of Chinese language literacy among rural students.

The emergence of digital dictionaries provides a "golden key" to solving the above problems. They can efficiently deliver massive, high-quality language and cultural resources to rural classrooms at low cost, compensating for the scarcity of physical resources. Their convenient query functions and rich multimedia features can stimulate students' interest in learning, transforming passive reception into active exploration. Their intelligent recommendation and data analysis capabilities enable teachers to implement differentiated teaching and precise tutoring. However, the introduction of technology is not a panacea that works overnight. How to effectively integrate the digital dictionary tool into the daily practice of rural Chinese language teaching, making it truly serve the substantive enhancement of students' Chinese language literacy rather than becoming a mere formal embellishment, is a systemic topic urgently requiring in-depth research.

Therefore, this study, grounded in the practical context of rural basic education, introduces the TPACK framework, which has broad influence in the field of educational technology integration. It aims to construct a systematic and operable "Research on Strategies for Enhancing Chinese Language Literacy in Rural Basic Education Based on Digital Dictionaries." This framework will transcend the perspective of mere technology application, deeply exploring the complex interactive relationships between technology (digital dictionaries), pedagogy (Chinese language teaching strategies), and content (Chinese language knowledge system). It seeks to explore how, through the deep integration of these three elements, the educational value of digital dictionaries can be maximized, providing solid theoretical support and clear practical pathways for the digital transformation of rural education.

2. Current Situation and Challenges of Chinese Language Literacy in Rural Basic Education

A thorough analysis of the current situation and challenges of Chinese language literacy in rural basic education is the logical starting point for constructing effective enhancement strategies. Currently, with the continuous policy support and investment, the hardware facilities in rural schools have significantly improved. However, the effectiveness of Chinese language literacy cultivation still shows a noticeable gap compared to urban areas. Behind this lies a complex predicament formed by the interweaving of multiple factors.

2.1 Unbalanced Development of Language Literacy

The overall level of Chinese language literacy in rural basic education exhibits an unbalanced and relatively lagging state. This imbalance is first reflected in foundational language abilities [3]. Due to relatively monolithic family language environments and scarce extracurricular reading resources, rural students are generally weaker than their urban peers in vocabulary size, as well as the accuracy and richness of language expression. Secondly, in terms of reading comprehension and thinking skills, rural students, exposed to limited text types and lacking effective guidance in reading strategies, often remain at the shallow extraction of textual information, finding it difficult to conduct deep analysis, evaluation, and creative thinking. Thirdly, at the level of cultural inheritance and aesthetic literacy, rural students' perception and identification with excellent Chinese traditional culture and classic literary works need strengthening. Although rural areas are rich in folk culture, it has not been effectively transformed into Chinese language educational resources, leading to limited cultural horizons and insufficient aesthetic experiences for students.

2.2 Multidimensional Challenges Constraining Literacy Enhancement

2.2.1 Structural shortage in educational resource

supply

Despite projects like "School-to-School Connectivity" improving hardware conditions, high-quality, suitable, and dynamically updated software resources, especially digital books, audio-visual materials, and interactive courseware needed for Chinese language teaching, remain scarce. Traditional paper dictionaries are slow to update, costly, and inconvenient to carry, making it difficult to meet the immediate and diverse query needs of teachers and students, directly limiting the breadth and depth of students' autonomous learning.

2.2.2 Intrinsic bottlenecks in teacher professional development

Rural Chinese language teachers face two core problems: First, lagging teaching concepts. Currently, rural education is still dominated by exam-oriented approaches; educational concepts have not fundamentally shifted. Many teachers' activities still revolve around knowledge point lectures and exercise drills, neglecting the comprehensive cultivation of students' language application skills, thinking quality, and humanistic literacy. Second, insufficient digital literacy. Educational information equipment in rural areas is not yet complete, and teachers' digital literacy needs improvement. Many teachers harbor apprehension towards emerging technological tools or only use them as electronic blackboards, failing to explore innovative models for deep integration of technology with subject teaching, resulting in low efficiency in technology application.

2.2.3 The "new divide" in student digital literacy

As China's rural development accelerates its digitalization and networking, the primary contradiction in the urban-rural digital divide is gradually shifting from infrastructure gaps to digital literacy gaps. Although rural students may have access to devices like smartphones, they are mostly used for entertainment and social interaction. They lack the ability to effectively use digital tools for learning, information discernment, and knowledge creation. This literacy gap means that even when faced with high-quality resources like digital dictionaries, they might only engage in shallow applications like "looking up words," failing to unleash the potential for inquiry-based learning and personalized development.

2.2.4 Bias in the educational evaluation system

An evaluation system centered on exam scores forces rural schools to devote most of their energy to exam-oriented training. This evaluation orientation neglects the process-oriented, comprehensive, and practical nature of Chinese language literacy, stifling teachers' motivation for teaching innovation and weakening students' intrinsic motivation to enhance literacy through extensive reading and language practice.

3. Educational Value and Application Potential of Digital Dictionaries

Facing the challenges in rural education, digital dictionaries are not merely technological substitutes but empowering tools capable of triggering paradigm shifts in teaching. Their unique educational value and application potential make them an ideal entry point for enhancing the Chinese language literacy of rural students.

3.1 Evolution and Core Characteristics of Digital Dictionaries

The development of digital dictionaries has undergone an evolution from "electronization" to "networking" and then to "intelligentization" [4]. Early electronic dictionaries were simple transplants of paper content with single functions. With the development of internet technology, online dictionaries like Google Translate and Youdao Dictionary added features such as voice reading, example sentence queries, and online definitions. In recent years, the integration of artificial intelligence has spawned a new generation of intelligent dictionary applications, equipped with advanced functions like intelligent recommendations, voice interaction, and image recognition. Hardware devices like dictionary pens have already demonstrated innovative application value in classroom teaching.

Their core characteristics are mainly reflected in:

3.1.1 Multimedia

Integrating text, audio, video, and images to concretize abstract language knowledge. For example, when learning Chinese characters, one can simultaneously watch stroke order animations, listen to standard pronunciations, and understand the etymological evolution, greatly enriching cognitive dimensions.

3.1.2 Interactivity

Through clicking, sliding, voice input, etc., users can interact with the dictionary in real-time, participating in vocabulary tests, read-along

scoring, and other learning activities, transforming passive reception into active construction.

3.1.3 Convenience

Primarily using mobile applications as carriers, breaking the constraints of time and space. The launch of the Modern Chinese Dictionary App transformed the bulky "tome" reference book into a small mobile application, quickly gaining popularity for its practicality, convenience, and innovation. Teachers and students can query anytime, anywhere, seamlessly integrating learning into life.

3.1.4 Intelligence

Based on big data and AI algorithms, they can achieve personalized recommendations. For example, based on users' query history and learning behavior, they intelligently push related vocabulary, articles, or cultural knowledge, constructing adaptive learning paths.

3.2 Application Potential in Rural Chinese Language Education

The above characteristics of digital dictionaries precisely address the pain points of rural Chinese language education, demonstrating immense application potential.

3.2.1 Compensating for resource shortages, expanding learning horizons

A high-quality digital dictionary is equivalent to a miniature library. It not only contains a massive vocabulary but also provides rich example sentences, authoritative discriminations, and detailed cultural background knowledge, effectively compensating for the lack of books and materials in rural schools, helping students broaden their reading horizons and enhance Chinese language literacy.

3.2.2 Optimizing teaching methods, enhancing classroom efficiency

Teachers can use digital dictionaries to quickly generate thematic vocabulary lists, design interactive games, and create multimedia situations, making classroom teaching more vivid and efficient. For example, in teaching classical poetry, teachers can use the dictionary to display recitations with background music and animations of the artistic conception, guiding students into immersive experiences and overcoming the dullness of traditional explanations.

3.2.3 Supporting autonomous learning, cultivating inquiry skills

Convenient query functions and rich associated knowledge provide powerful support for student-led inquiry. When encountering new words in reading, students can instantly look them up and delve deeper into their usage and allusions. This "learn-as-you-go" model helps cultivate independent thinking and problem-solving abilities.

3.2.4 Promoting educational equity, narrowing the urban-rural gap

With their low cost and high efficiency, digital dictionaries enable rural students to conveniently access authoritative language learning resources of the same quality as their urban counterparts, providing the technological possibility to promote educational equity from the source.

4. TPACK Framework: Theoretical Cornerstone and Integration Path

With the development of informatization, digital textbooks are increasingly entering classrooms. As important carriers for conducting teaching activities in the digital environment of basic education, digital textbooks are both the junction point between the supply side and demand side in the informatization of primary and secondary schools and the "bull's nose" for the digital transformation of classroom teaching in basic education [5]. Digital dictionaries are an important component of this. To achieve the leap of digital dictionaries from "usable" to "easy to use" and then to "well used," it is necessary to transcend technological instrumentalism and examine and integrate them within a scientific theoretical framework. The TPACK framework provides such a powerful analytical lens, as "TPACK ability based on digital textbooks has a positive promoting effect" [6].

4.1 Connotation Analysis of the TPACK Framework

The TPACK framework was proposed by Mishra and Koehler in 2006. It reveals the complex interwoven and interactive relationship between technology, pedagogy, and content [7]. The framework includes seven core knowledge domains:

4.1.1 Content knowledge (CK)

Understanding of the Chinese language subject itself, including the knowledge system of characters, words, sentences, passages, grammar, rhetoric, logic, and literature, as well as the culture, thought, and aesthetics embodied within.

4.1.2 Pedagogical knowledge (PK)

General knowledge and skills about teaching

processes, teaching strategies, classroom management, student evaluation, etc., such as how to organize group cooperative learning or conduct inquiry-based teaching.

4.1.3 Technological knowledge (TK)

Understanding, operation, and application ability of technologies like digital dictionaries, including familiarity with their functions, troubleshooting technical problems, and evaluating their educational applicability.

4.1.4 Pedagogical content knowledge (PCK)

The teaching wisdom of transforming specific Chinese language content into forms easily understood and mastered by students, for example, how to explain abstract rhetorical devices using storytelling.

4.1.5 Technological content knowledge (TCK)

Understanding how technology changes the representation and organization of Chinese language content. For example, how digital dictionaries reconstruct the network structure of vocabulary knowledge through hyperlinks and knowledge graphs.

4.1.6 Technological pedagogical knowledge (TPK)

Understanding how technology supports specific teaching methods. For example, how to use the interactive functions of digital dictionaries to conduct gamified vocabulary teaching.

4.1.7 TPACK

This is the core of the framework. It refers to the comprehensive literacy of teachers to flexibly and effectively integrate technology, pedagogy, and content in specific teaching contexts to promote students' deep understanding and ability development.

4.2 Integration Path under the TPACK Framework

Guided by the TPACK framework, the integration of digital dictionaries with rural Chinese language teaching is not a simple superposition of "technology + teaching" but a systematic reconstruction process. Its integration path can be summarized as:

4.2.1 CK as the foundation

Clearly define the core Chinese language problems to be solved using digital dictionaries. Is it expanding vocabulary, deepening text comprehension, or cultivating cultural confidence? Content goals are fundamental.

4.2.2 PK as the bridge

Which teaching strategies best leverage the advantages of digital dictionaries? Is it for the flipped classroom in pre-class preparation, a scaffolding tool for in-class inquiry, or a personalized resource library for post-class extension? Teaching methods are key.

4.2.3 TK as the engine

Proficiently master the functions of digital dictionaries and creatively combine these functions according to teaching needs, such as integrating pronunciation, stroke order, example sentences, and cultural stories into one teaching activity. Technology application is the driver.

4.2.4 Pursuing TPACK integration

The ultimate goal is to achieve a state of "moistening things silently." Teachers no longer deliberately think "I need to use technology" but naturally integrate digital dictionaries as part of their instructional design. Technology, content, and methods become seamlessly integrated, jointly serving the generation of students' Chinese language literacy. For example, when teaching "Viewing the Lushan Waterfall," a teacher guides students to use a digital dictionary to look up words like *bao* (waterfall), *chuan* (river), and *ziyan* (purple mist), not only understanding their literal meanings but also experiencing the artistic conception and majesty of the poem by watching waterfall videos and listening to related poetry recitations. This process perfectly integrates CK (poem content), PK (situational teaching method), and TK (multimedia query function), forming a typical TPACK teaching practice.

5. Construction of Enhancement Strategies Based on the TPACK Framework

Based on the above analysis, this study constructs a "four-pronged" strategy framework for enhancing Chinese language literacy in rural basic education. Guided by TPACK theory, this framework synergistically exerts force from the four dimensions of content, teaching, technology, and ecology, forming a closed-loop, sustainable improvement system.

5.1 Content Deepening Strategy: Using Digital Dictionaries to Construct a "Living" Knowledge System

This strategy focuses on the expansion and deepening of CK, aiming to transform static Chinese language knowledge into a dynamic, interconnected, and living knowledge network using digital dictionaries.

5.1.1 Contextualization and networking of vocabulary learning

Guide students to use digital dictionaries not only to query the "sound, form, meaning" of words but also to pay attention to their rich example sentences, synonym discrimination, antonym associations, and actual pragmatic contexts. Encourage students to build personalized "vocabulary cloud maps" centered around a word through hyperlink functions, connecting isolated knowledge points into a network. Ultimately achieving an update in the learning model, "supporting students in exploring personalized learning paths, forming a 'diverge-focus-diverge again' learning pattern" [8].

5.1.2 Deepening and diversifying text interpretation

In reading teaching, guide students to use digital dictionaries to query key information, cultural allusions, and historical backgrounds in the text. For example, when studying Lu Xun's works, students can look up his biography, historical context, and related critiques to help them transcend the surface of the text and conduct deep interpretation.

5.1.3 Concretization and contextualization of cultural inheritance

Explore resources within digital dictionaries related to Chinese character culture, folk customs, idiom stories, etc. Combining them with local rural culture, carry out project-based learning activities like "Finding Idioms from Hometown" or "Festival Stories in Digital Dictionaries," enabling students to rediscover and identify with the culture around them empowered by technology, realizing the connection between Chinese language learning and life.

5.2 Teaching Innovation Strategy

Reshaping Teaching Models Based on Digital Dictionaries

Learning is the process where the subject, utilizing "innate body schemas and mirror neurons," gradually generates interactive experiences and establishes and perfects cognitive structures through interaction and coupling with the environment [9]. This strategy of reshaping teaching models based on digital dictionaries focuses on the innovation of PK and PCK, aiming to leverage digital dictionaries as a fulcrum to transform traditional teaching models and promote student agency.

5.2.1 Constructing a new "flipped classroom" model

Teachers use digital dictionaries to create micro-lessons or learning task sheets before class, guiding students to independently preview new characters/words and understand background knowledge. Class time is then focused on higher-order thinking activities such as discussion, inquiry, and presentation, realizing "first learn, then teach; teach according to learning."

5.2.2 Designing "inquiry-based learning" task chains

Centered around a core problem or theme, design a series of inquiry tasks that require the use of digital dictionaries to complete. For example, with the theme "moon," have students in groups query different images of the moon in classical poetry and analyze their emotional connotations, culminating in a presentation of findings. This cultivates students' information literacy and research skills.

5.2.3 Implementing "gamified" teaching

Modern teaching requires new methods and new media; "the medium is the extension of man" [10]. Utilize the interactive functions of digital dictionaries, this new medium, such as vocabulary competitions, read-along scoring, crossword puzzles, etc., to make tedious review and consolidation sessions interesting and engaging, stimulating students' learning interest and intrinsic motivation.

5.3 Technological Empowerment Strategy: Enhancing Digital Literacy and Tool Application Skills for Teachers and Students

This strategy focuses on improving TK, TCK, and TPK, aiming to solve the problems of "unable to use" and "not good at using," providing capability assurance for strategy implementation.

5.3.1 Conducting precise teacher training

Training content should not be limited to the functional operation of digital dictionaries but should focus more on TPACK-based instructional design workshops. Through case studies, same-lesson-different-design activities, micro-teaching, etc., guide teachers to explore how to cleverly combine dictionary functions with specific teaching content and methods.

5.3.2 Developing school-based application guides

Organize key teachers to compile a "Digital Dictionary Subject Application Guide" based on the school's student situation and textbooks, providing specific application cases and

instructional design templates for different lesson types (character recognition, reading, composition), lowering the practice threshold for ordinary teachers.

5.3.3 Cultivating student information literacy

Offer dedicated courses or lectures teaching students how to use digital dictionaries efficiently and critically. This includes how to retrieve information quickly, how to filter information, and how to use tools for autonomous learning, transforming students from passive "consumers" to active "creators."

5.4 Ecological Collaboration Strategy: Building a Multi-Party Linked Support and Guarantee System

This strategy focuses on optimizing the external environment, aiming to integrate forces from all parties to create a favorable ecosystem for the deep application of digital dictionaries.

5.4.1 Strengthening infrastructure and resource construction

Governments and schools should continue investing to ensure stable network bandwidth in rural schools, achieve full wireless network coverage on campus, and especially guarantee strong network signals in mountainous rural areas. Simultaneously, uniformly procure or recommend a batch of authoritative, high-quality, and rural-education-adapted digital dictionary products, and explore the establishment of regional mechanisms for co-construction and sharing of digital educational resources.

5.4.2 Improving incentive and evaluation mechanisms

In the educational evaluation system, increase the assessment of students' process-based performance in Chinese language literacy, such as reading volume, oral expression, and inquiry outcomes. Concurrently, in teacher evaluation, establish awards like "Innovation in Information Technology and Teaching Integration" to motivate teachers to actively explore reforms based on digital dictionaries.

5.4.3 Promoting home-school-community collaborative education

Through activities like parent-teacher meetings and open days, demonstrate the learning value of digital dictionaries to parents, provide guidance for home use, and encourage parents to participate in their children's digital learning process, forming a synergistic educational force.

6. Conclusion

Against the backdrop of rural education revitalization, intelligent educational tools represented by digital dictionaries provide a historic opportunity to solve the long-standing challenges of Chinese language literacy in rural basic education. The "four-pronged" enhancement strategy constructed in this study, based on the TPACK framework, emphasizes the deep integration of technology, pedagogy, and content. It aims to internalize digital dictionaries from external auxiliary tools into an organic component of the rural Chinese language teaching ecosystem. This strategy framework not only focuses on the allocation of "things" (resources) but also values the development of "people" (teachers and students), stimulating the endogenous motivation of educational subjects by enhancing teachers' TPACK literacy and students' digital literacy.

Of course, the proposal of this framework is still at the theoretical construction stage. Its effectiveness and universality need empirical testing in rural schools across different regions. Future research can further focus on: comparative studies on the impact of different types of digital dictionaries (e.g., Apps, hardware, online platforms) on various dimensions of Chinese language literacy across different grade levels; exploration of application models for personalized dictionary recommendation systems based on AI technology in large-scale differentiated teaching in rural areas; and how to deeply integrate local rural cultural data with digital dictionary content to develop Chinese language learning resources with stronger local characteristics.

Ultimately, technology is the means, and education is the end. The true value of digital dictionaries lies not in how advanced their technology is, but in whether they can be skillfully harnessed by wise educators, whether they can truly ignite rural children's love for language and text, and whether they can open a door for them to a broader world. By adopting this approach, dictionaries serve as bridges and technology as wings, paving the way for genuine educational equity and high-quality development.

Acknowledgments

Key Project of Jiangxi Provincial Education Planning: "Research on the Reform Path of Teaching Evaluation for Cultural Quality Courses in Agricultural and Forestry

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