Journal of World Englishes and Educational Practices
ISSN: 2707-7586
DOI: 10.32996/jweep
Journal Homepage: www.al-kindipublisher.com/index.php/jweep

JWEEP
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Developing a Game-Based Learning Repository for Chinese Vocabulary Instruction

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| ABSTRACT
This study aims to develop a systematic game-based learning repository to support Chinese vocabulary instruction aligned with HSK levels 1–4. A mixed-method approach was adopted, including literature review, survey research, product development, and pedagogical experimentation. The study collected data from 86 Chinese language teachers to examine current practices and challenges in using educational games. Results indicate that although teachers recognize the effectiveness of game-based learning in enhancing student motivation and vocabulary retention, they face significant constraints, particularly in terms of time and availability of suitable teaching resources. Based on these findings, the study developed a repository consisting of more than 100 vocabulary learning games using platforms such as Wordwall and HTML-based web games. The system was integrated into a learning management platform and tested over a two-month period with 68 participants, including teachers and trainee teachers. The findings confirm that the repository improves teaching efficiency, increases student engagement, and supports vocabulary acquisition effectively. This study contributes by proposing a scalable and reusable digital resource system rather than isolated teaching tools. It also identifies key principles for designing effective educational games. Future research should expand the experimental scope and incorporate adaptive learning technologies.

| KEYWORDS
Game-based learning; Chinese vocabulary; HSK; digital learning resources; educational games

| ARTICLE INFORMATION
ACCEPTED: 25 April 2026 **PUBLISHED:** 26 May 2026 **DOI:** 10.32996/jweep.2026.8.3.5

1. Introduction

In the digital era, game-based learning (GBL) has become an increasingly prominent approach in language education due to its ability to enhance learner motivation, engagement, and knowledge retention. A growing body of research indicates that integrating game elements into instructional design can create interactive learning environments that foster active participation and deeper cognitive processing (Plass et al., 2015; Laine & Lindberg, 2020). From a theoretical perspective, GBL supports experiential learning by allowing learners to actively construct knowledge through meaningful interactions and immediate feedback mechanisms. In particular, GBL has been shown to be more effective than traditional teaching methods in supporting vocabulary acquisition, as it combines repetition, contextualization, and reinforcement in a dynamic and engaging manner (Al-Sofi, 2024; Pradheepa et al., 2025). Empirical evidence also suggests that learners exposed to game-based activities demonstrate higher levels of retention and long-term recall compared to those using conventional memorization techniques (Gavharoy, 2024).

In the context of Chinese language teaching, vocabulary acquisition plays a fundamental role in developing overall language proficiency. However, it often presents significant challenges for both teachers and learners due to the unique linguistic features of Chinese, including tonal pronunciation, Pinyin transcription, and logographic writing systems. These characteristics require specialized teaching approaches that go beyond rote learning and demand a higher level of cognitive engagement. Recent studies have highlighted the effectiveness of digital platforms and interactive tools in supporting Chinese vocabulary learning by providing

multimodal input and contextualized practice opportunities (Guo, 2024; Wang, 2024). In addition, the application of game-based approaches, such as role-play and simulation activities, has been found to enhance learners' communicative competence and practical language use (Trang, 2024).

Despite these advantages, the implementation of GBL in Chinese language classrooms remains limited. Many educators recognize the pedagogical value of games but encounter difficulties in designing and integrating them effectively into their teaching practices. The development of educational games requires not only technological skills but also a solid understanding of instructional design principles, including alignment with learning objectives, appropriate difficulty levels, and meaningful feedback systems (Shi & Shih, 2015; Kucher, 2021). Furthermore, studies on gamification emphasize that the effectiveness of game elements depends on their combination and integration rather than their isolated use, highlighting the need for a more systematic approach (Dende et al., 2025).

Another critical issue lies in the lack of structured and reusable teaching resources. Existing digital platforms, while widely available, are often designed as general-purpose tools and do not adequately address the specific requirements of Chinese language instruction, particularly in relation to HSK vocabulary standards. As a result, teachers are required to spend considerable time adapting or creating materials, which reduces efficiency and limits the scalability of game-based learning practices. Research in the Vietnamese context has also pointed out that although gamification enhances learner interaction and satisfaction, its practical implementation is constrained by resource limitations and the lack of ready-to-use instructional materials (Viet et al., 2024; Hồng, 2019). This fragmented and tool-based approach diminishes the long-term sustainability and broader impact of GBL initiatives in real educational settings.

To address these gaps, this study proposes the development of a comprehensive game-based learning repository tailored specifically for Chinese vocabulary instruction aligned with HSK standards. Unlike previous approaches that focus on individual applications, the proposed system is designed as a structured, scalable, and reusable digital resource. It integrates a wide range of interactive game formats, including matching, quizzes, simulations, and role-playing activities, which are systematically organized according to HSK levels and instructional objectives. The repository not only provides ready-to-use learning materials but also supports teachers in selecting and adapting appropriate activities for different stages of instruction, such as introduction, practice, and reinforcement.

By combining pedagogical principles with technological tools, the proposed repository aims to reduce teachers' workload while enhancing teaching effectiveness and learner engagement. More importantly, it contributes to bridging the gap between theoretical research on game-based learning and its practical implementation in real classroom contexts. In doing so, the study provides both theoretical and practical implications for the design and application of digital learning resources in Chinese language education.

2. Literature Review

GBL has been widely recognized as an effective pedagogical approach in language education. It refers to the integration of game elements into learning activities to enhance motivation, engagement, and learning outcomes. According to Plass et al. (2015), GBL facilitates active learning by combining cognitive, emotional, and social dimensions, thereby improving knowledge retention and learner performance. From a theoretical perspective, GBL is grounded in constructivist learning theory, where learners actively construct knowledge through interaction and experience. Similarly, Laine and Lindberg (2020) emphasize that well-designed educational games can create meaningful learning experiences by incorporating clear goals, immediate feedback, and appropriate levels of challenge, all of which are essential for sustaining learner motivation and promoting deeper learning.

A substantial body of empirical research has demonstrated the effectiveness of GBL in vocabulary acquisition. Vocabulary learning, which often relies on repetition and memorization, can benefit significantly from the interactive and engaging nature of game-based activities. For instance, Al-Sofi (2024) found that students participating in game-based learning activities showed significantly higher levels of vocabulary retention and engagement compared to traditional teaching methods. Likewise, Pradheepa et al. (2025), through a meta-analysis, confirmed that language games have a consistent positive impact on vocabulary learning outcomes across different learner groups and educational contexts. In addition, Gavharoy (2024) reported that learners exposed to GBL not only improved their vocabulary acquisition but also demonstrated greater motivation and confidence in language use. These findings collectively suggest that GBL functions not merely as a motivational tool but as an effective instructional strategy that enhances both cognitive and affective aspects of language learning.

In the context of Chinese language teaching, the application of GBL has attracted increasing scholarly attention due to the unique characteristics of the Chinese language. Unlike alphabetic languages, Chinese involves tonal pronunciation, Pinyin transcription, and logographic writing systems, which pose additional challenges for learners. Studies have shown that digital games can effectively support the learning of Chinese characters and vocabulary by providing multimodal input and contextualized practice opportunities (Guo, 2024). Similarly, Wang (2024) highlighted that digital game design grounded in pedagogical theory can improve learners' ability to recognize and retain Chinese characters. Furthermore, research on game design models underscores the importance of aligning game mechanics with learning objectives to ensure educational effectiveness (Shi & Shih, 2015). These studies indicate that when properly designed, GBL can address the specific learning difficulties associated with Chinese vocabulary acquisition.

In Vietnam, research on the use of games in language teaching has also reported positive outcomes, particularly in enhancing student engagement and interaction. Several studies have explored the use of digital platforms and role-playing activities to support language learning. For example, Trang (2024) demonstrated that role-play-based learning activities can significantly improve students' communicative competence and vocabulary usage in Chinese language classes. Similarly, Viet et al. (2024) found that gamification enhances learner interaction, satisfaction, and academic performance. Earlier studies have also emphasized the pedagogical value of games in fostering a more dynamic and student-centered learning environment (Hồng, 2019). However, despite these benefits, these studies consistently highlight practical challenges, particularly the time and effort required for teachers to design and implement game-based activities, as well as the lack of readily available and structured teaching resources.

Despite the growing body of literature supporting GBL, a critical gap remains in the development of systematic and reusable learning resources. Most existing approaches focus on individual tools, specific applications, or isolated classroom interventions rather than comprehensive systems that can be scaled and reused across different teaching contexts. As noted by Dende et al. (2025), the effectiveness of gamification depends not only on individual game elements but also on how these elements are systematically integrated. However, current implementations often lack this level of integration, resulting in fragmented solutions that limit long-term applicability. Consequently, teachers often face difficulties in consistently applying GBL in their teaching practices, which reduces its overall impact in real educational settings.

Therefore, this study addresses the identified gap by developing a comprehensive game-based learning repository tailored for Chinese vocabulary instruction. Unlike previous studies that focus on individual applications, this research emphasizes the creation of a structured, scalable, and reusable system that supports teachers in implementing GBL more effectively. By organizing learning materials according to HSK standards and integrating diverse game formats into a unified platform, the proposed approach aims to enhance both teaching efficiency and learning outcomes. In doing so, the study contributes to advancing the practical application of GBL while providing a systematic solution to existing limitations in the field.

3. Methodology

This study employs a mixed-method research design combining theoretical analysis, empirical investigation, and product development. The research process consists of three main stages. First, a literature review was conducted to establish the theoretical foundation of game-based learning and identify key design principles for educational games. Second, a survey was administered to 86 Chinese language teachers to investigate current practices, challenges, and needs related to the use of games in teaching. Third, a game-based learning repository was developed and implemented in a real teaching context. The experimental phase was conducted over a two-month period, involving 68 participants, including teachers and trainee teachers. Data were collected through questionnaires and analyzed using descriptive statistical methods to evaluate the feasibility, effectiveness, and user satisfaction of the system.

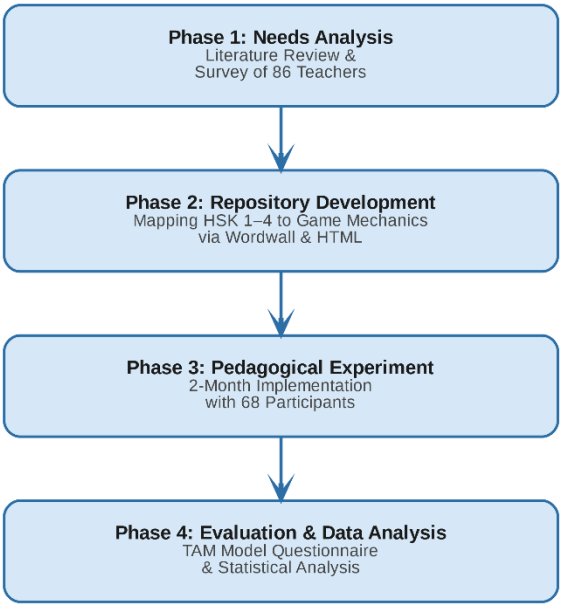

Figure 1. Research Design and Implementation Flowchart

3.1 Objective

The primary objective of this study is to develop and evaluate a game-based learning (GBL) repository designed to support Chinese vocabulary instruction aligned with HSK levels 1–4. In addition, the study aims to investigate current practices in the use of educational games in Chinese language teaching and to identify factors influencing the effectiveness of game-based vocabulary learning.

3.2 Participants and Data Collection

The study is based on primary data collected through a structured questionnaire and pedagogical experimentation. The target population consists of Chinese language teachers, trainee teachers, and learners who are actively involved in Chinese language teaching and learning activities. A total of 70 participants were invited to take part in the study, including both in-service teachers and trainee teachers. Among these, 68 valid responses were collected, resulting in a response rate of approximately 97%. This sample size is considered sufficient to provide initial insights into the feasibility and effectiveness of the proposed game-based learning repository.

3.3 Tools and Learning Platforms

This study utilized multiple digital tools to design and implement the game-based learning repository. Specifically, platforms such as Wordwall and HTML-based web games were employed to develop interactive vocabulary learning activities aligned with HSK levels 1–4. In addition, a learning management system (LMS) was used to organize, store, and distribute the learning materials, allowing participants to access and apply the games in real teaching contexts. These tools ensured both flexibility in design and practicality in classroom implementation.

3.4 Repository Design and Framework

The repository was systematically designed to align with HSK 1–4 vocabulary standards. Recognizing the unique challenges of Chinese L2 acquisition—specifically tonal accuracy, Pinyin transcription, and logographic character recognition (Hanzi)—the games were categorized into different cognitive tasks. To address these specific linguistic features, the repository utilizes a variety of mechanics:

- **Direct Mapping:** "Wordwall Match-up" activities were developed to facilitate the direct mapping of Hanzi to their corresponding Pinyin and native language meanings, aiding in foundational character recognition.
- **Dynamic Retrieval:** For fast-paced recall practice, interactive formats such as "Whack-a-Mole" were designed. For example, in one module, students must quickly hit the mole carrying the correct Pinyin or tone mark for a displayed character (e.g., matching "Hànyǔ" to "汉语"), which trains quick reflex memory for tones.
- **Contextual Application:** HTML-based simulation games were integrated for intermediate (HSK 3 and 4) learners. These focus on context-based vocabulary gap-filling and sentence construction, ensuring that learners progress from isolated character recognition to practical application within a sentence context.

Table 1. Alignment of HSK Levels, Linguistic Challenges, and Game Mechanics

Target Proficiency	Key Linguistic Challenge	Game Mechanic Category	Digital Tool / Platform	Example Activity
HSK 1 – 2	Pinyin & Hanzi Recognition	Direct Mapping	Wordwall (Match-up)	Dragging Hanzi to match the correct Pinyin and native translation
HSK 1 – 3	Tonal Accuracy & Quick Recall	Dynamic Retrieval	Wordwall / HTML (Whack-a-Mole)	Hitting a moving target displaying the correct tone mark for a spoken word
HSK 3 – 4	Vocabulary in Context & Syntax	Contextual Application	HTML Simulation Games	Role-playing scenarios requiring gap-filling with appropriate vocabulary

3.5 Data Analysis

The collected data were analyzed using descriptive statistical methods, including mean scores and percentage distributions, to summarize participants' evaluations of the effectiveness and usability of the game-based learning repository. Participants' responses were measured using a five-point Likert scale ranging from 1 (very low) to 5 (very high), allowing for a quantitative assessment of their perceptions. This approach is widely used in educational research due to its simplicity and effectiveness in summarizing survey data; however, as Likert-scale data are inherently ordinal, the use of mean values may present certain limitations, particularly in capturing subtle differences at the extreme ends of the scale.

4. Results and Discussion

4.1 Results

4.1.1 Current Practices and Challenges

The survey results from 86 valid responses reveal several important insights into the current use of game-based learning in teaching Chinese vocabulary. In terms of teaching experience, the majority of participants have between 3–5 years of experience (40.7%), followed by those with less than 3 years (37.2%), while more experienced groups (6–10 years and above 10 years) account for a smaller proportion (15.1% and 7%, respectively).

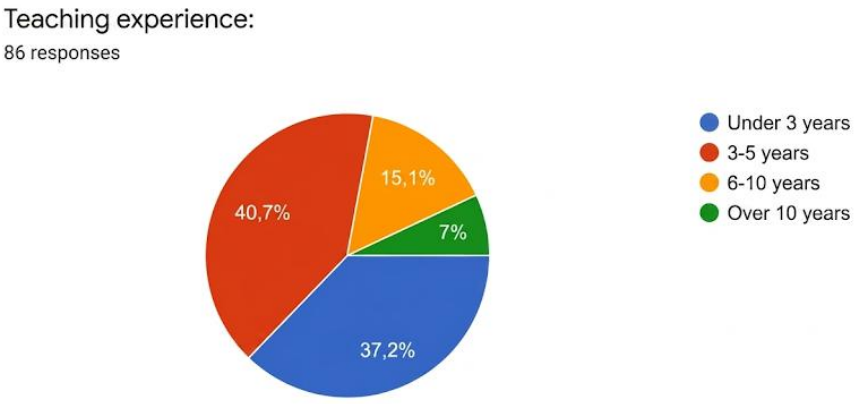

Figure 2. Distribution of teaching experience

Regarding teaching context, all respondents (100%) are currently teaching lower secondary school students, while a high proportion also teach at language centers (94.2%) and high schools (81.4%). Only 14% are involved in teaching university students. This indicates that the dataset is highly concentrated on secondary-level learners, a group characterized by high engagement needs and preference for interactive learning methods.

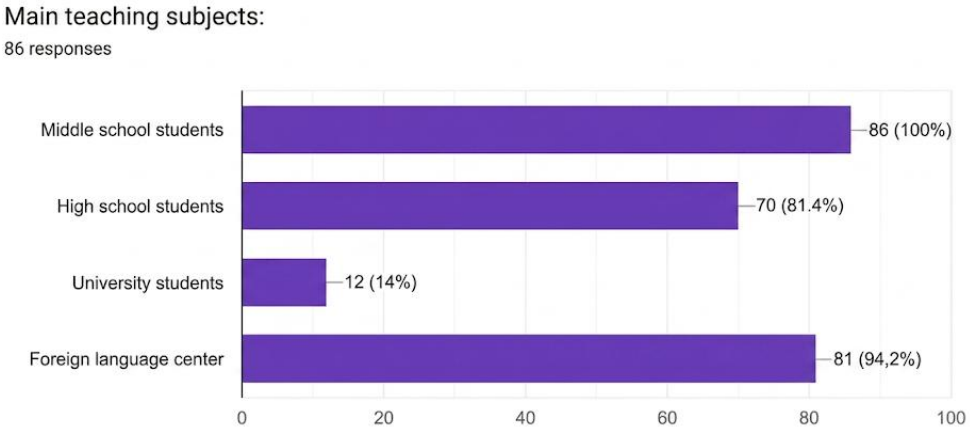

Figure 3. Distribution of teaching targets

In terms of game usage frequency, the findings show that 30.2% of teachers occasionally use games and 29.1% use them frequently, while 9.3% report very frequent use. Meanwhile, 25.6% rarely use games and only 5.8% have never used them. This suggests that game-based learning has been widely adopted, though not yet consistently implemented across all teaching contexts.

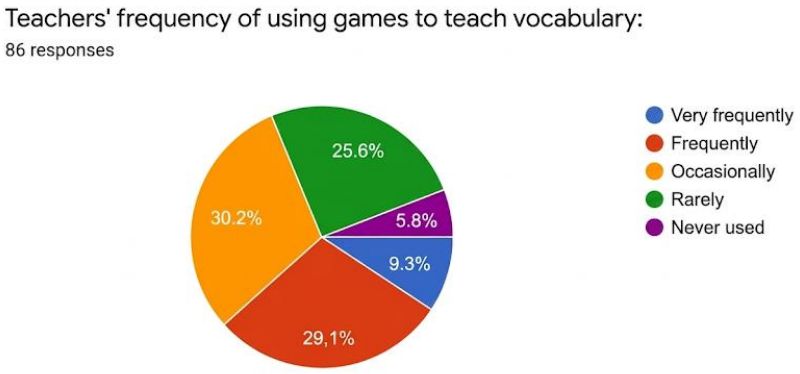

Figure 4. Frequency of using games in vocabulary teaching

The perceived effectiveness of game-based learning is generally positive. A total of 58.2% of respondents rate it as effective or highly effective (both at 29.1%), while 22.1% consider it moderately effective. However, 19.7% perceive it as having low or no effectiveness, indicating that current tools and implementations still present certain limitations.

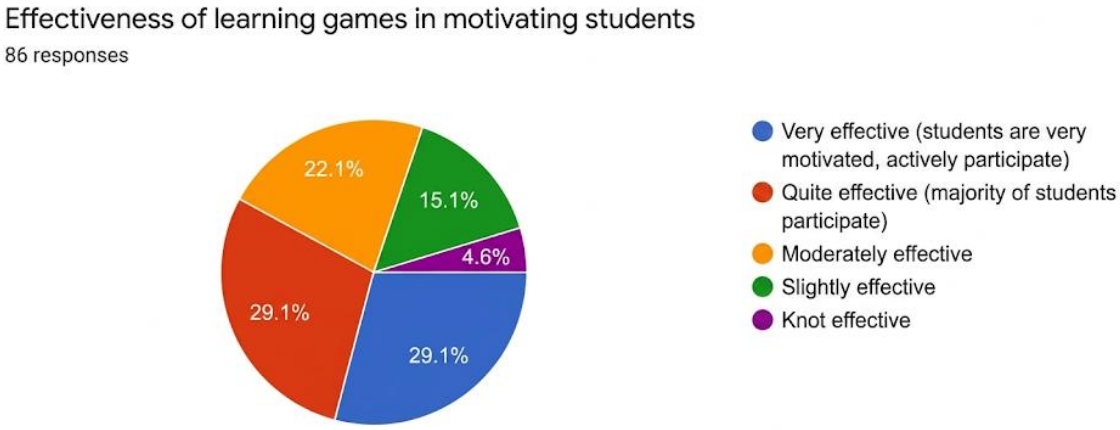

Figure 5. Effectiveness of game-based learning

Regarding lesson integration, games are most commonly used in the warm-up stage (95.3%), followed by consolidation (84.9%) and application (73.3%), while only 44.2% of teachers use games for introducing new vocabulary. In addition, the duration of game activities is typically short, with 43% lasting 5–10 minutes and 32.6% under 5 minutes, reflecting the need for concise and efficient game design.

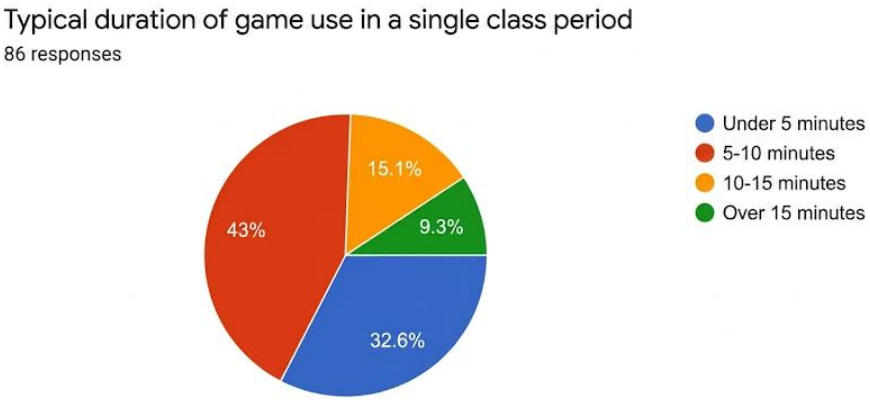

Figure 6. Integration stages and duration of game use

Finally, despite the positive perception, several barriers remain. The most significant challenges include lack of resources and difficulty in designing suitable games (84.9%), time constraints (72.1%), and difficulty in aligning games with lesson objectives

(81.4%). These findings highlight a clear gap between the recognized benefits of game-based learning and its practical implementation, emphasizing the need for a structured and specialized game resource system for teaching Chinese vocabulary.

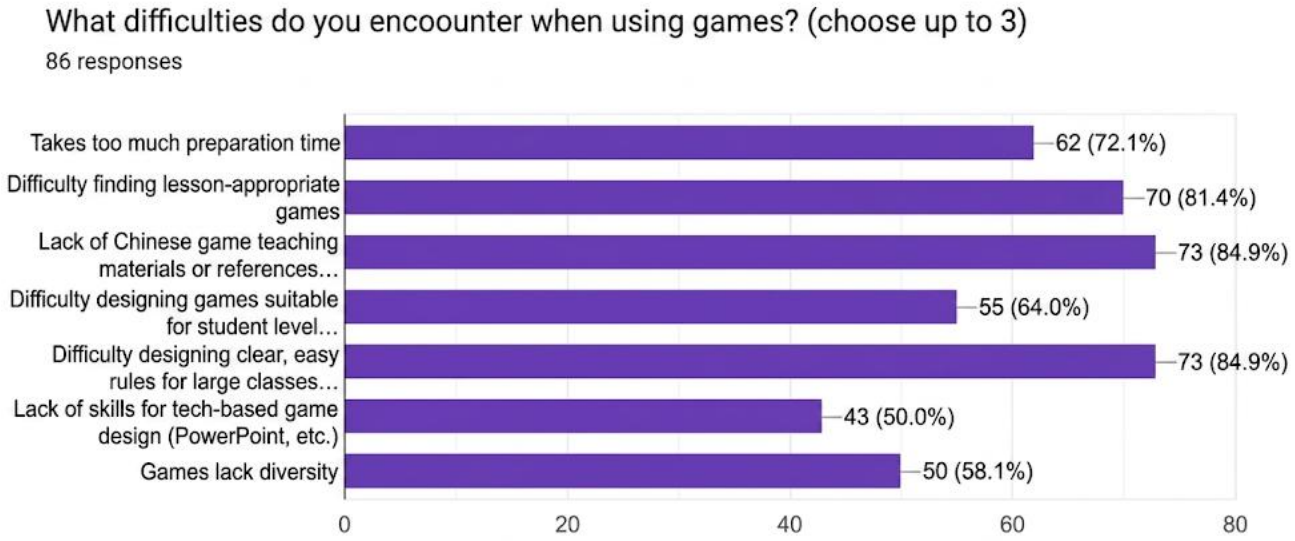

Figure 7. Perceived challenges in using game-based learning in Chinese vocabulary teaching

4.1.2 Evaluation of the Game-Based Learning Repository (Experiment with 68 Participants)

Following the two-month experimental phase, feedback was collected from the 68 participating teachers and trainee teachers to evaluate the repository's feasibility and pedagogical impact. Drawing on principles from the Technology Acceptance Model (TAM), participants rated the system across three core dimensions on a 5-point Likert scale: System Usability, Learner Engagement, and Perceived Effectiveness in Vocabulary Retention.

- **System Usability and Preparation Time:** A vast majority of participants (88.2%) rated the repository as "easy" or "very easy" to integrate into their lesson plans (Mean = 4.35). Teachers specifically noted that the structured, ready-to-use nature of the HSK-aligned games significantly reduced their preparation time compared to designing ad-hoc game activities from scratch.
- **Learner Engagement:** The repository successfully addressed the engagement barriers noted in the initial survey. Approximately 92.6% of participants observed a noticeable increase in student participation and enthusiasm (Mean = 4.60), particularly when the games were utilized during the warm-up and consolidation phases of the lesson.
- **Perceived Effectiveness on Vocabulary Retention:** Regarding pedagogical impact, 85.3% of the educators reported that students demonstrated improved short-term recall of Pinyin, tones, and character meanings after engaging with the interactive modules (Mean = 4.25). While formal standardized testing of the students was not the primary focus of this phase, the strong positive consensus among teachers validates the repository's role as a highly effective supplementary teaching tool for Chinese vocabulary acquisition.

Table 2: Participant Evaluation of the GBL Repository (n = 68)

Evaluation Dimension (TAM Model)	Mean Score (Out of 5.0)	Positive Feedback (%)	Key Qualitative Observation
System Usability & Prep Time	4.35	88.2%	Ready-to-use HSK formats significantly reduced lesson planning time
Learner Engagement	4.60	92.6%	Notable increase in student participation during warm-up phases
Perceived Vocabulary Retention	4.25	85.3%	Improved short-term recall of Pinyin, tones, and character meanings

4.2 Discussions

The findings of this study confirm the effectiveness of game-based learning (GBL) in supporting Chinese vocabulary acquisition, which is consistent with previous research (Al-Sofi, 2024; Pradheepa et al., 2025). Participants reported high levels of engagement and satisfaction, indicating that integrating interactive game elements into vocabulary instruction enhances the overall learning

experience. The use of diverse game formats, such as matching, quizzes, and simulation-based activities, enabled learners to actively engage with HSK vocabulary rather than rely on passive memorization. This supports the view that meaningful interaction and immediate feedback play a crucial role in effective language learning (Plass et al., 2015).

A key contribution of this study lies in the development of a systematic and reusable GBL repository aligned with HSK levels and instructional objectives. This structured system allows teachers to easily select appropriate activities for different stages of instruction, including introduction, practice, and reinforcement, thereby improving instructional efficiency and ensuring coherence in the learning process. In addition, the availability of ready-to-use and adaptable materials significantly reduces teachers' workload and preparation time, addressing one of the major barriers to the adoption of GBL in real teaching contexts.

Furthermore, the findings highlight the importance of pedagogical design principles in enhancing the effectiveness of game-based learning. These include alignment with learning objectives, immediate feedback, appropriate levels of challenge, and contextualized learning scenarios, with simulation-based activities proving particularly effective for vocabulary application. The alignment of the repository with standardized frameworks such as HSK also enhances its applicability in formal educational settings. However, several limitations should be noted, including the relatively small sample size, short experimental duration, and minor technical issues reported by participants. Future research should expand the sample scope, conduct longitudinal studies, and explore the integration of advanced technologies to further improve learning outcomes.

5. Conclusion

This study aimed to design and evaluate a systematic game-based learning (GBL) repository for Chinese vocabulary instruction aligned with HSK levels 1–4. The initial survey of 86 Chinese language teachers revealed a strong recognition of GBL's benefits but highlighted a critical lack of structured, ready-to-use resources, which previously hindered practical implementation. By developing a targeted digital repository, this study successfully bridged the gap between theoretical GBL frameworks and classroom practice.

The subsequent two-month experiment with 68 teachers and trainees demonstrated that the repository not only significantly reduces teacher preparation time but also effectively boosts learner engagement and perceived vocabulary retention. These findings have important implications for Chinese L2 education in Vietnam, proving that structured, reusable digital resources can directly address the specific linguistic challenges of teaching Chinese characters, Pinyin, and tones. Future research should aim to conduct longitudinal studies with larger student cohorts to measure standardized learning outcomes, expand the repository to accommodate advanced proficiency levels (HSK 5–6), and explore the integration of AI-driven adaptive difficulty to further personalize the learning experience.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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