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Designing and Evaluating Minecraft-based Gamification Activities to Support Thai Learners' Motivation, Confidence, and Learning Experience in Chinese Grammar Learning

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Abstract

This study designed and evaluated the Grammar Adventure Center, a Minecraft-based gamification activity for Chinese grammar learning among Thai learners. The activity was developed as a custom Minecraft Bedrock world that combined route-based progression, short Chinese prompts, ten multiple-choice grammar questions, a penalty-and-retry mechanism, and a first-attempt score display. A one-group pretest-posttest design was used with 34 valid matched participants. Data were collected through pre- and post-surveys and analyzed using descriptive statistics, Wilcoxon signed-rank tests, and internal consistency analysis. The results showed generally positive post-activity perceptions. Participants gave relatively high ratings to understanding Chinese grammar use in context and opportunities to practice grammar during the activity. Confidence in using Chinese grammar to construct sentences increased significantly, $Z = -3.11$, $p = 0.002$, $r = 0.53$, with a mean increase of 0.62 points on a five-point scale. Motivation to improve Chinese grammar, willingness to try game-based learning, and grammar review remained relatively stable. Overall, the findings suggest that the activity may provide a supportive environment for Chinese grammar review and confidence-building practice when game mechanics are clearly connected with language-learning tasks.

Keywords: Minecraft, gamification, Chinese grammar learning, Thai learners, learning motivation, learning experience

■ Introduction

Chinese grammar is often challenging for Thai learners due to differences in sentence structure, word order, grammatical markers, aspect particles, and specific sentence patterns. Traditional approaches, mainly teacher explanation, textbook exercises, and repeated drills, may facilitate memorization of forms

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but provide limited opportunities for learners to apply grammar in meaningful contexts. As a result, learners may perceive grammar learning as abstract, repetitive, and less engaging.

Gamification and game-based learning have been increasingly applied in education to create interactive, learner-centered experiences. Gamification uses game design elements in non-game contexts, such as missions, challenges, levels, rewards, immediate feedback, progress indicators, and repeated attempts, to structure learning activities and enhance engagement and motivation (Deterding et al., 2011; Hamari et al., 2014; Dichev & Dicheva, 2017). Prior studies indicate that the effectiveness of gamification depends on alignment with instructional goals; superficial inclusion of game elements without meaningful learning tasks may produce limited educational benefits.

Game-based learning emphasizes cognitive, motivational, affective, and social foundations, leveraging interaction, challenge, feedback, and problem-solving to support learning (Plass et al., 2015). In the context of language learning, this approach allows learners to experience grammar as a tool for meaningful action rather than isolated drills. Immediate feedback, low-stakes failure, and repeated attempts are particularly relevant for promoting self-efficacy (Bandura, 1997) and engagement in grammar practice.

Minecraft, as a sandbox digital game, offers a flexible and modifiable environment suitable for designing interactive learning activities. Its open-ended structure enables spatial navigation, exploration, task completion, and interaction with designed environments. Prior reviews have highlighted Minecraft's potential for learning through construction, collaboration, and task-based progression (Nebel et al., 2016). Unlike mobile apps or short online exercises, Minecraft allows for extended narratives, spatial movement, and integrated tasks that support immersive learning experiences.

In this study, the "Grammar Adventure Center" was designed as a Minecraft-based gamification activity for Chinese grammar learning. Learners progressed through a route-based Minecraft Bedrock world that included short Chinese prompts, obstacle-based tasks, a language verification point, ten grammar questions, and a penalty-and-retry mechanism for incorrect answers. The activity was designed to connect selected Chinese grammar review tasks with game progression and repeated attempts, rather than presenting grammar questions as a separate worksheet.

In this study, reported Chinese proficiency at HSK Level 3 or above was used as an inclusion criterion to ensure that participants had sufficient prior exposure to Chinese grammar for completing the activity. This criterion was not used as an objective proficiency test in the study. Rather, it helped identify learners who were likely to be able to understand the selected grammar items and participate in a grammar review activity conducted through Minecraft.

The present study addresses the use of Minecraft-based gamification for Chinese grammar learning among Thai learners. Specifically, it describes the design of the Grammar Adventure Center and examines Thai learners' self-reported changes in motivation and confidence after participating in the activity, as well as their perceived learning experiences. A one-group pretest-posttest design was used to examine selected corresponding indicators of motivation and confidence, while post-activity survey items and open-ended responses were used to describe learners' activity perceptions and learning experience.

■ Research Questions

1. How was the Grammar Adventure Center designed to integrate Minecraft-based gamification elements with selected Chinese grammar review tasks for Thai learners?

2. What self-reported changes in motivation and confidence, and what perceived learning experiences, were observed among Thai learners after participating in the Minecraft-based grammar activity?

■ Significance and Purposes

1. To describe the design of the Grammar Adventure Center and explain how Minecraft-based gamification elements were connected with Chinese grammar learning tasks.

2. To examine Thai learners' self-reported changes in motivation and confidence after participating in the Minecraft-based grammar activity and to describe their perceived learning experiences.

■ Literature Reviews

Gamification and Game-based Learning in Education

Gamification refers to the use of game design elements in non-game contexts to structure activities, increase participation, and support persistence (Deterding et al., 2011; Hamari et al., 2014; Dichev & Dicheva, 2017). In education, gamification should not be understood simply as adding entertainment features to learning activities. Its value depends on how game elements, such as missions, challenges, feedback, progress indicators, and repeated attempts, are connected with instructional objectives.

For language learning, this connection is especially important because learners need repeated exposure and opportunities to use language forms in meaningful contexts. Grammar learning often requires learners not only to recognize rules but also to apply them when constructing sentences or interpreting meaning. If game elements are disconnected from grammar practice, an activity may be enjoyable but educationally weak. Therefore, gamified grammar learning should connect game progression with language use and practice.

Game-based learning provides a related perspective by emphasizing structured goals, interaction, feedback, challenge, and problem solving (Plass et al., 2015). In a game-based language learning environment, learners can respond to tasks, make choices, receive feedback, and continue after mistakes. Prior studies on digital games and language learning also suggest that games should be evaluated according to how gameplay supports meaningful language-learning processes, rather than by novelty or enjoyment alone (Cornillie et al., 2012; Peterson, 2013; Reinders, 2012). These ideas are relevant to the present study because the Grammar Adventure Center connected grammar questions with route progression, feedback, and repeated attempts in Minecraft.

Minecraft as a Digital Learning Environment

Minecraft offers a flexible digital environment for designing task-based learning activities. Learners can navigate virtual spaces, follow prompts, complete challenges, and interact with designed routes or objects. Previous research has highlighted Minecraft's educational potential because it allows construction, exploration, collaboration, and task-based progression (Nebel et al., 2016). Compared with fixed quiz-based platforms, Minecraft allows instructors or designers to create learning routes, checkpoints, prompts, task areas, and feedback mechanisms.

In the present study, Minecraft was used as the platform for implementing a custom grammar review activity. The value of Minecraft in this context lies in its ability to combine spatial progression with task completion. Learners did not only answer grammar questions on a screen; they moved through different parts of the Grammar Adventure Center and encountered grammar tasks as part of the route. This design helped place grammar review within an interactive game environment rather than presenting it as a separate worksheet.

Chinese Grammar Learning, Task Progression, and Learner Confidence

Chinese grammar can be challenging for Thai learners because sentence patterns, word order, grammatical markers, and structural forms may differ from Thai. Learners may understand a grammar rule in explanation but still feel uncertain when using it to construct sentences. From a task-based learning perspective, grammar practice should give learners opportunities to use language forms to complete meaningful tasks, rather than only memorizing rules or doing isolated exercises (Ellis, 2003).

The Grammar Adventure Center followed this idea by embedding grammar questions in a game route. Learners needed to answer grammar questions in order to continue through the activity. Correct answers allowed them to move forward, while incorrect answers triggered a short penalty scene and then returned them to the same question. This design made grammar practice part of task completion and game progression.

Feedback and repeated attempts may also be related to learners' confidence. Bandura (1997) described self-efficacy as learners' beliefs about their ability to organize and carry out actions needed to achieve goals. In language learning, confidence may influence whether learners are willing to attempt grammar tasks and use grammar to construct sentences. In the present activity, learners were given opportunities to try again after incorrect answers, which may have helped them feel more capable of completing the grammar tasks. However, because this study measured self-reported motivation, confidence, and learning experience rather than objective grammar achievement, the findings should be interpreted in relation to learners' perceived responses to the activity.

In relation to the variables examined in this study, gamified and game-based learning environments may influence learners in different ways. Motivation is related to learners' willingness to participate in and continue a learning activity, while confidence concerns learners' perceived ability to complete grammar tasks or apply grammar in sentence construction. Learning experience reflects how learners perceive the activity process, including task clarity, engagement, difficulty, feedback, and operational support. Therefore, the present study examined not only whether learners' motivation and confidence changed after the activity, but also how they perceived the activity as a learning experience.

Overall, the literature suggests that Minecraft-based gamification can support language learning when game mechanics, task progression, feedback, and learning objectives are clearly aligned. For Chinese grammar learning, this means that the game environment should not only provide an engaging experience, but also create structured opportunities for learners to review grammar, make choices, retry after errors, and experience progress. These ideas informed the design of the Grammar Adventure Center and provided the basis for evaluating Thai learners' motivation, confidence, and learning experience after participating in the activity.

■ Research Methods

Research Design

This study adopted a one-group pretest-posttest design to examine Thai learners' motivation and confidence before and after participating in a Minecraft-based gamification activity for Chinese grammar learning. The study did not include a control group. All valid participants completed the same learning activity and responded to both the pre-survey and post-survey.

The purpose of this design was not to compare different instructional groups, but to evaluate changes in learners' self-reported motivation and confidence and to describe their perceived learning experience after completing the activity. Therefore, the study focused on the overall tendency of the valid matched sample.

Participants

Participants were Thai learners of Chinese aged 20 years or above who reported Chinese proficiency at HSK Level 3 or above. They were recruited from two sources: undergraduate Chinese major students ($n = 27$) and adult learners of Chinese from the wider community ($n = 7$). These two sources were used for recruitment only and were not treated as comparison group.

To be included in the study, participants had to be Thai nationals aged 20 years or above, report Chinese proficiency at HSK Level 3 or above, complete the Minecraft-based activity and both the pre- and post-surveys, and provide informed consent. After incomplete, unmatched, duplicate, or ambiguous responses were removed, 34 valid matched responses were retained for analysis.

Ethical approval was obtained from the relevant university committee, and all participants provided informed consent before participation.

Minecraft-Based Gamification Activity

The learning activity was designed as a custom Minecraft Bedrock world named "Grammar Adventure Center". It was developed to provide a game-based space for reviewing selected Chinese grammar structures through movement, task completion, and question-based progression. The activity was not used as a standardized HSK test; rather, it served as a short grammar review activity for learners who already reported Chinese proficiency at HSK Level 3 or above.

In the activity, participants entered a virtual training facility and moved through a sequence of designed areas, such as the starting area, training rooms, blocked corridors, obstacle routes, a language verification point, and a final escape area. The route used parkour-style movement, short Chinese prompts, signs, checkpoints, and obstacle-based tasks. These elements provided story context, navigation, and movement-based tasks for the activity. The formal grammar questions were placed in the language verification point within this route.

The language verification point was the main grammar task section. It contained ten Chinese grammar questions. The language verification point was the only formal grammar-question section in the activity. All ten grammar questions were placed in this section, and all items were single-answer, four-option multiple-choice questions. The other areas of the Grammar Adventure Center, such as the starting area, route guidance sections, obstacle routes, penalty scenes, and final escape area, mainly provided story context, navigation, movement challenges, and visual scenes that supported the overall game experience.

Although the grammar questions were located in the language verification point, several items were designed with reference to the game situation. For example, some questions involved situations such as following a route prompt, opening a door, activating a main switch, or reading an in-game notice. These items were not reading comprehension questions in which learners searched for answers from a passage. Rather, they were sentence-level grammar application items connected with the game context. Learners needed to choose the grammatically appropriate sentence, select the corrected sentence, or identify the option that best matched the communicative situation before continuing the route.

Representative examples included an item on the sequence structure “先.....再.....”, where the correct option was “先把总开关打开，再穿过铁门”; an item requiring learners to repair an incorrect sentence, “我把昨天老师布置的作业还没写完”, by selecting the corrected option “昨天老师布置的作业我还没写完”; and an item on the 被-construction, where the correct option was “那张提示纸已经被老师贴在门口了.” These examples illustrate how the questions combined game-related situations and sentence-level grammar review, while remaining focused on grammar use rather than reading comprehension. Table 1 summarizes the main game design elements and their corresponding learning purposes in the Grammar Adventure Center.

Table 1.

Mapping Between Game Design Elements and Learning Purposes

Game design element	How it was used in the activity	Learning purpose
Story-based route	Learners entered a virtual training facility and followed an escape route before and after the language verification section.	To provide a game context for the grammar verification section.
Chinese prompts and signs	Short Chinese prompts appeared in the route and task scenes.	To expose learners to Chinese in the game environment.
Language verification point	All ten grammar questions were placed in this section. All questions were single-answer, four-option multiple-choice items.	To provide a focused section for reviewing and applying selected Chinese grammar points.
Context-linked questions	Some questions used situations related to the game, such as route prompts, notices, operation sequences, or escape tasks.	To connect grammar choices with the game situation while still focusing on grammar use.
Correct-answer progression	A correct answer allowed learners to move on to the next question or stage in the language verification section.	To make answering grammar questions part of moving forward in the verification section.
Penalty-and-retry mechanism	An incorrect answer triggered a short penalty scene and then returned learners to the same question.	To let learners try again after mistakes without ending the activity.

Game design element	How it was used in the activity	Learning purpose
First-attempt score display	After the grammar section, the system showed the number of questions answered correctly on the first attempt.	To give learners a simple summary of their performance.

Note. The activity provided game-based responses, such as moving on after a correct answer or retrying after an incorrect answer. It did not provide detailed grammar explanations after each item.

As shown in Figure 1, the activity used a penalty-and-retry mechanism. When a learner selected the correct answer, the system allowed the learner to proceed to the next question or stage within the language verification section. When a learner selected an incorrect answer, a short penalty scene was triggered, such as falling into the void, entering an illusion area, or being redirected to a lava zone. After the penalty scene, the learner returned to the same question and tried again until the correct answer was selected. In this design, an incorrect answer did not end the activity but became part of the game process and led to another attempt.



Figure 1. Selected scenes from the Grammar Adventure Center, a custom Minecraft Bedrock world designed for Chinese grammar review

Note: Chinese signs and prompts shown in the screenshots were used as in-game guidance and task instructions. (A) Story context and mission introduction, where learners received the initial task information; (B) route guidance prompt indicating that the path ahead was blocked and that learners should click the trapdoor mechanism to cross; (C) language verification area where learners answered Chinese grammar questions to continue the route; (D) penalty-and-retry scene after an incorrect answer, indicating that learners needed to return and try the question again; (E) route guidance and task prompts after the verification section; (F) final escape area.

At the end of the language verification section, the system displayed the number of questions answered correctly on the first attempt. This display was used as part of the game experience. Individual response histories, numbers of attempts for each question, and detailed grammar explanations were not exported for analysis.

Two versions of the activity were provided: an easier version and a more difficult version. Both versions used the same story, route sequence, Chinese prompts, and ten grammar questions. The difference was limited to the difficulty of movement and obstacle completion, such as jumping distance, path width, and number of obstacles. Participants could choose either version and could switch versions if needed. Their version choices were not recorded and were not used as a variable in the analysis. Before starting the activity, all participants received the same video showing basic operations, including movement, jumping, and entering the Minecraft world. Written instructions were also provided to explain how to import and open the world file. Participants completed the activity individually and asynchronously during the data collection period.

Instruments and Data Collection

The research instruments included a pre-survey, a Minecraft-based grammar activity, and a post-survey. The pre-survey was administered before the activity to collect eligibility information, demographic background, Chinese learning background, previous Minecraft experience, familiarity with game controls, and baseline responses related to Chinese grammar learning. It included five core five-point Likert-scale items on motivation to improve Chinese grammar, confidence in using Chinese grammar, perceived ability to learn Chinese grammar, willingness to try game-based learning, and expectations for grammar review.

The post-survey was administered after participants completed the Minecraft-based activity. It included fourteen closed-ended five-point Likert-scale items and open-ended questions. The closed-ended items covered motivation and confidence after the activity, perceived grammar learning experience, perceptions of the activity design, opportunities for grammar practice, clarity of guidance, task difficulty, technical or operational problems, stress, and acceptable time and effort. The open-ended questions asked participants to describe enjoyable parts of the activity, difficulties they experienced, and suggestions for improvement. For positively worded Likert-scale items, higher scores indicated more positive responses. For items related to technical problems, stress, or operational difficulty, higher scores indicated stronger perceived difficulty or discomfort.

The survey items were developed by the researcher based on the research questions, the activity design, and the constructs examined in this study. They were not used as a standardized motivation or self-efficacy scale. Instead, they were designed as concise activity-specific instruments to capture learners' immediate responses to the Minecraft-based grammar activity, including motivation, confidence, grammar review experience, activity design, guidance, difficulty, technical issues, stress, and acceptable time and effort.

The fourteen post-survey items were intended to provide a focused activity-specific evaluation rather than a comprehensive standardized measurement of all three variables. The items covered learners' post-activity motivation and confidence, perceived grammar review and practice opportunities, activity design and task clarity, operational difficulty, stress, and acceptable time and effort. Because learning experience included several different aspects of the activity, such as engagement, task clarity, difficulty, guidance, and technical issues, these items were reported descriptively at the item level rather than combined into a single total score. The paired pre- and post-activity analysis was therefore limited to selected corresponding indicators of motivation, confidence, willingness to try game-based learning, and grammar review.

The questionnaire items were reviewed by three experts, including one specialist in Chinese language teaching and two specialists in educational technology, using an item-objective congruence (IOC) procedure. The experts evaluated whether each item was consistent with its intended construct or research purpose using a +1, 0, and -1 rating format. The IOC values ranged from 0.67 to 1.00, with a mean IOC value of 0.95. These values indicated acceptable content validity. Based on the experts' comments, the researcher further checked and clarified the construct classification of the questionnaire items before final implementation.

Internal consistency was examined using Cronbach's alpha for the main Likert-scale sections based on the 34 valid matched responses. The pre-survey core Likert-scale items showed good internal consistency ($\alpha = 0.852$). In the post-survey, Section 1 showed excellent internal consistency ($\alpha = 0.942$), and Section 2 showed excellent internal consistency ($\alpha = 0.906$). Section 3 was analyzed descriptively because its items addressed different aspects of technical difficulty, guidance, stress, and acceptable time and effort rather than a single construct.

The ten grammar questions embedded in the Minecraft activity were reviewed separately by two Chinese language teachers working in Thailand. Their review focused on grammatical accuracy, clarity of wording, whether each item had one clear correct answer, and whether the questions were appropriate for learners with reported HSK Level 3 or above Chinese proficiency.

Data were collected from March 15 to May 30, 2026. Participants first completed the pre-survey. They then received the Minecraft world file, written instructions, and a video showing basic operations, including movement, jumping, and entering the world. After completing the activity, participants completed the post-survey. Participant codes rather than personal names were used to match pre- and post-survey responses. Incomplete, unmatched, duplicate, or ambiguous responses were removed before analysis, leaving 34 valid matched responses. During data cleaning, two minor participant-code inconsistencies were corrected for matching purposes: "009" was recoded as "B009", and "004" was recoded as "A004". These corrections did not change participants' responses and were made only to match the pre- and post-survey records accurately.

Data Cleaning and Analysis

Descriptive statistics, including means and standard deviations, were used to summarize participants' background information, Minecraft experience, pre-survey responses, and post-survey responses. Wilcoxon signed-rank tests were used for selected corresponding pre- and post-activity items because the responses were collected using five-point Likert-scale items, the sample size was relatively small, and the analysis did not assume normally distributed paired differences. The paired comparisons

focused on motivation to improve Chinese grammar, confidence in using Chinese grammar to construct sentences, willingness to try game-based learning, and grammar review.

For each Wilcoxon signed-rank test, the test statistic, standardized Z value, p value, and effect size were reported. Effect size was calculated as $r = |Z|/\sqrt{N}$, where N was the number of valid matched responses. Following Cohen's (1988) conventional guidelines, effect sizes of approximately 0.10, 0.30, and 0.50 were interpreted as small, medium, and large, respectively.

Post-activity items related to activity design, task experience, technical or operational issues, and open-ended feedback were analyzed descriptively because these items were intended to capture learners' perceptions after completing the Minecraft-based activity.

■ Results and Discussion

Results

After data cleaning, 34 valid matched responses were included in the analysis. The participants consisted of 27 undergraduate Chinese major students and 7 adult Chinese learners from the wider community. These two sources represented recruitment sources only and were not treated as experimental or comparison groups. Most participants were aged 20-25 years old. More than half of the participants had never played Minecraft before ($n = 18$, 52.9%), and the mean score for familiarity with game controls was 2.41 out of 5. This information was reported as descriptive background because the activity required Minecraft-based navigation; it was not tested as a predictor of learning outcomes.

Table 2.
Participant Characteristics

Variable	Category	n/Mean	%/SD
Recruitment source	Undergraduate Chinese major students	27	79.4%
	Adult Chinese learners from the wider community	7	20.6%
Age	20-25 years	27	79.4%
	26-30 years	1	2.9%
	31-35 years	6	17.6%
Educational background	Secondary school or equivalent	4	11.8%
	Bachelor's degree	26	76.5%
	Higher than bachelor's degree	4	11.8%
Years of Chinese learning	1-3 years	1	2.9%
	4-6 years	21	61.8%
	7-10 years	4	11.8%
	More than 10 years	6	17.6%
	Prefer not to specify	2	5.9%

Variable	Category	n/Mean	%/SD
Minecraft experience	Never played Minecraft	18	52.9%
	Played occasionally	14	41.2%
	Played regularly	2	5.9%
Familiarity with game controls	Mean score on a five-point scale	2.41	SD=1.56

Note. Percentages were calculated based on the final valid matched sample ($n = 34$). The two participant sources represented recruitment sources only and were not treated as comparison groups.

After completing the Grammar Adventure Center activity, participants generally reported positive learning experiences and activity perceptions. As shown in Table 3, the highest mean score was found for understanding Chinese grammar use in context ($M = 3.94$, $SD = 0.85$), followed by opportunities to practice Chinese grammar during the activity ($M = 3.91$, $SD = 0.97$), clarity and understandability of grammar tasks ($M = 3.85$, $SD = 0.82$), observing and reviewing Chinese grammar use ($M = 3.82$, $SD = 0.83$), and appropriateness of task difficulty ($M = 3.82$, $SD = 0.90$). These results suggest that participants tended to perceive the activity as useful for contextual grammar review and practice.

Participants also reported positive motivation during the activity ($M = 3.76$, $SD = 0.85$), engagement during the activity ($M = 3.76$, $SD = 0.99$), and confidence in trying to use Chinese grammar to construct sentences after the activity ($M = 3.71$, $SD = 0.87$). The item on willingness to participate in similar game-based activities in the future received a slightly lower but still positive mean score ($M = 3.56$, $SD = 1.19$).

Section 3 focused on operational difficulty, guidance, stress, and acceptable effort. The mean score for technical or control problems interfering with grammar learning was 2.56 ($SD = 0.93$), suggesting that such problems were present for some learners but were not rated as severe overall. The mean score for stress during the activity was relatively low ($M = 1.94$, $SD = 1.04$). Participants gave moderate ratings for the usefulness of pre-activity guidance for beginners ($M = 3.15$, $SD = 0.86$) and the acceptability of time and effort required to complete the activity ($M = 3.21$, $SD = 0.73$).

Table 3.

Post-Survey Descriptive Statistics

Item	M	SD
Motivation during the activity	3.76	0.85
Confidence in trying to use Chinese grammar to construct sentences	3.71	0.87
Understanding Chinese grammar use in context	3.94	0.85
Willingness to participate in similar game-based activities in the future	3.56	1.19
Observing and reviewing Chinese grammar use	3.82	0.83
Clarity of instructions and steps for entering the game and starting the task	3.59	1.08
Clarity and understandability of grammar tasks	3.85	0.82
Engagement during the game activity	3.76	0.99
Appropriateness of task difficulty	3.82	0.90
Opportunities to practice Chinese grammar during the activity	3.91	0.97
Technical or control problems interfering with grammar learning	2.56	0.93
Usefulness of pre-activity guidance for beginners	3.15	0.86
Stress during the activity	1.94	1.04
Acceptability of time and effort required	3.21	0.73

Note. Items were rated on a five-point scale. For items related to technical or control problems and stress, lower scores indicate fewer negative experiences.

Paired Comparison of Pre- and Post-Activity Responses: Four corresponding pre- and post-activity indicators were compared using Wilcoxon signed-rank tests: motivation to improve Chinese grammar, confidence in using Chinese grammar to construct sentences, willingness to try game-based learning, and grammar review. The results are presented in Table 4.

Table 4.

Wilcoxon Signed-Rank Test Results for Corresponding Pre- and Post-Activity Items

Indicator	Pre-survey M (SD)	Post-survey M (SD)	W	Z	p	r
Motivation to improve Chinese grammar	3.88 (0.91)	3.76 (0.85)	27.00	-0.98	0.328	0.17
Confidence in using Chinese grammar to construct sentences	3.09 (0.83)	3.71 (0.87)	40.00	-3.11	0.002	0.53
Willingness to try game-based learning	3.71 (1.12)	3.56 (1.19)	32.50	-0.52	0.604	0.09
Grammar review	3.82 (1.11)	3.82 (0.83)	59.50	-0.03	0.976	0.01

Note. Wilcoxon signed-rank tests were used for selected corresponding pre- and post-activity indicators. Effect size was calculated as $r = |Z|/\sqrt{N}$.

The Wilcoxon signed-rank tests showed a significant increase in learners' confidence in using Chinese grammar to construct sentences, from $M = 3.09$ ($SD = 0.83$) before the activity to $M = 3.71$ ($SD = 0.87$) after the activity, $Z = -3.11$, $p = 0.002$, $r = 0.53$. This effect size was large. No significant differences were found for motivation to improve Chinese grammar, willingness to try game-based learning, or grammar review. These results suggest that the activity was associated with an increase in self-reported grammar-use confidence, while the other corresponding indicators remained relatively stable.

Supplementary Open-Ended Feedback

Open-ended responses were reviewed descriptively as supplementary feedback. Several participants mentioned that they enjoyed the game-based format, the question-answering section, and the opportunity to review Chinese grammar in a more interactive setting. Some comments also pointed to operational difficulties, such as movement control, repeated failure in obstacle sections, unclear text display, or limited familiarity with Minecraft. A few participants mentioned that they still felt uncertain about specific Chinese grammar points and would have preferred additional explanations or examples. These

comments were consistent with the quantitative results showing generally positive activity perceptions alongside some operational and technical challenges.

Discussion

Summary of Key Findings

This study designed and evaluated the Grammar Adventure Center, a Minecraft-based gamification activity for Chinese grammar learning among Thai learners. The findings showed that participants generally reported positive post-activity learning experiences and activity perceptions. The most notable quantitative result was the significant increase in learners' self-reported confidence in using Chinese grammar to construct sentences. In contrast, motivation to improve Chinese grammar, willingness to try game-based learning, and grammar review remained relatively stable.

These results suggest that the activity was more closely associated with learners' perceived confidence in applying grammar than with broad changes in motivation. This interpretation is consistent with the pre-activity data, which showed that participants already entered the activity with relatively positive motivation toward Chinese grammar learning. Therefore, the activity may not have substantially increased general motivation, but it appeared to provide a learning experience in which learners felt more confident trying to use Chinese grammar.

Interpretation of the Findings

The increase in grammar-use confidence may be related to the design of the activity. In the Grammar Adventure Center, learners did not answer grammar questions as isolated worksheet items. Instead, all formal grammar questions were placed in the language verification point, while several items drew on situations related to the broader game route, such as notices, route prompts, operation sequences, or escape-related scenarios. Correct answers allowed learners to proceed to the next question or stage within the verification section, while incorrect answers triggered short penalty scenes and led to another attempt.

This design is relevant to self-efficacy because learners' confidence can be supported when they are given opportunities to try, fail, retry, and eventually complete a task. However, the present study did not directly measure grammar achievement or long-term learning outcomes. Therefore, the significant result should be interpreted as an increase in self-reported confidence rather than direct evidence of improved Chinese grammar proficiency.

The stable motivation-related results may also be explained by the participants' initial motivation and by the operational demands of Minecraft. More than half of the participants had never played Minecraft before, and the mean score for familiarity with game controls was relatively low. Although the game environment provided an interactive grammar review experience, limited experience with Minecraft may have made movement control and task navigation challenging for some learners. This may have reduced the motivational benefit of the activity for participants who needed more time to adapt to the game environment.

Design Features and Implications

Several design features appeared to support learners' positive experience. First, the language verification point served as a focused grammar-question section within the Minecraft activity. Learners answered the ten grammar questions in this section and moved to the next question or stage after selecting the correct answer. Second, the penalty-and-retry mechanism allowed incorrect answers to become part of the game process and gave learners another chance to attempt the same question. Third, the first-attempt score display provided a simple summary of performance within the game experience. Another design feature was the modular structure of the activity. The route, prompts, and grammar questions were designed in a way that could be revised or replaced in future versions. Therefore, while the present study focused on selected Chinese grammar structures, the same activity structure may be adapted for other grammar points, vocabulary review, or cultural knowledge tasks. However, such adaptation would require further design, expert review, and learner evaluation.

At the same time, the findings indicate that Minecraft-based grammar activities require careful operational support. Learners with limited Minecraft experience may need clearer guidance, more readable in-game prompts, and a short practice area before beginning the main grammar tasks. In future versions, brief grammar explanations or hints could also be added after each question to help learners understand why an answer is correct.

Overall, the study suggests that Minecraft-based gamification can be used as a supportive environment for Chinese grammar review when game mechanics are clearly connected with language-learning tasks. For this type of activity, the educational value does not come from using Minecraft alone, but from how the game route, prompts, grammar questions, game-based outcome responses, retry opportunities, and score display are aligned with the learning purpose.

■ Conclusion

This study designed and evaluated the Grammar Adventure Center, a Minecraft-based gamification activity for Chinese grammar learning among Thai learners. The activity used a custom Minecraft Bedrock world to combine a route-based game environment with short Chinese prompts, embedded grammar questions, a penalty-and-retry mechanism, and a first-attempt score display. The design aimed to provide learners with opportunities to review selected Chinese grammar structures through task progression and repeated attempts.

The findings showed that participants generally reported positive post-activity learning experiences and activity perceptions. The most notable quantitative result was the significant increase in learners' self-reported confidence in using Chinese grammar to construct sentences after completing the activity. In contrast, motivation to improve Chinese grammar, willingness to try game-based learning, and grammar review remained relatively stable.

These findings suggest that the Grammar Adventure Center may be useful as a supportive environment for Chinese grammar review, especially in relation to learners' perceived confidence in applying grammar. However, the findings should be interpreted within the scope of the study design. The study did not include a control group or an objective grammar achievement test, so the results should not be interpreted as direct evidence of improved grammar proficiency. Rather, the contribution of this study lies in describing the design of a Minecraft-based grammar activity and providing initial evidence of learners' self-reported responses to the activity.

The study also highlights the importance of aligning game mechanics with language-learning tasks. In this activity, the educational value of Minecraft depended not only on the game environment itself, but also on how route progression, Chinese prompts, grammar questions, retry opportunities, and score display were connected with the purpose of grammar review.

■ Limitations and Recommendations

This study has several limitations. First, the sample size was relatively small, with 34 valid matched participants, and most participants were undergraduate Chinese major students. Therefore, the findings may not be generalizable to all Thai learners of Chinese. Second, the study used a one-group pretest-posttest design without a control group. As a result, the findings should be interpreted as learners' self-reported changes and perceptions after participation rather than as strong causal evidence of the activity's effectiveness. Third, the study relied mainly on questionnaire data and did not include an objective grammar achievement test. In addition, the survey was designed as a concise activity-specific instrument rather than a comprehensive standardized scale for motivation, confidence, and learning experience. Future studies should consider using more detailed validated scales or additional items to examine these constructs more comprehensively. Therefore, the significant increase in confidence should be understood as an increase in perceived ability rather than direct evidence of improved grammar proficiency.

Another limitation concerns learners' familiarity with Minecraft. More than half of the participants had never played Minecraft before, and some participants reported operational or technical difficulties. These factors may have influenced their activity experience and could have affected how they perceived the grammar tasks. In addition, although two versions of the activity were provided to reduce operational difficulty, participants' version choices were not recorded and were not analyzed as a variable.

Future studies should include larger and more diverse samples of Thai learners, including learners from different universities, proficiency levels, and adult learning contexts. A control or comparison group should also be considered to better examine the specific contribution of Minecraft-based gamification. In addition, future research should include objective grammar assessments before and after the activity to examine whether increased confidence is accompanied by measurable improvement in grammar performance.

For future development of the Grammar Adventure Center, clearer operational guidance should be provided for learners who are not familiar with Minecraft. A short in-game practice area before the main grammar tasks may help learners become familiar with movement, jumping, and interaction controls. In-game text should also be made more readable, and optional hints or brief grammar explanations could be added after each question. Future versions may also record learners' version choices, number of attempts, first-attempt accuracy for each item, and common error patterns so that learning processes can be analyzed in more detail.

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