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Engaging Language Learning through Gamification: Designing Interactive Games for Foreign Language Acquisition

[1*]Bema Rita D. Diesto, MA.Ed. and [2]Arnold M. Narte, MSCS

[1] Iloilo Science and Technology University
Iloilo City Campus, Iloilo, Philippines
[2]Iloilo Science and Technology University
Miagao Campus, Iloilo, Philippines
[1]bemarita.diesto@isatu.edu.ph
[1]Orcid ID: 0009-0004-8109-616X
[2]arnold.narte@isatu.edu.ph
[2]Orcid ID:0009-0007-4468-073X

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ABSTRACT

The inclusion of foreign languages in the Philippine education curriculum is meant to make graduates competitive in the global arena. The study aimed to develop an interactive game for foreign language learners, focusing on the Japanese language. The researchers used the Agile Methodology for Mobile Applications, consisting of six phases: brainstorming, design, development, quality analysis, feedback, and acceptance. The application was installed on a mobile phone using an Android API and adhered to the functional suitability standard set by ISO 25050. The study used the ISO 20510 Standard Questionnaires for evaluation and the mean and standard deviation for data analysis. The results show that the game fully conformed to the ISO 25050 functional suitability standard. It is an approach for more interactive foreign language learning. Future researchers should enhance some features of the mobile application.

Keywords: Engaging Language Learning, Gamification, Designing Interactive Games, Foreign Language Acquisition

1. INTRODUCTION

1.1. Background of the Study

Learning a foreign language is now a part of the Philippine education curriculum in lower and higher education. Courses such as tourism management, hospitality management, automotive, and other courses now include foreign languages as one of the subjects. According to Senator Jinggoy Estrada, the author of Senate Bill No. 2341, or the proposed Foreign Language Education Act, "This will equip Filipino students to be 21st-century learners. They will be able to connect with the world and be more globally competitive in their future workplaces." The senator believes that learning a foreign language will equip students with the necessary knowledge that would serve as an advantage in future jobs and the personal growth of the students (Torregoza, 2023).

Learning a foreign language is a difficult task. Although learning a foreign language is advantageous, students struggle to learn it. This is due to the introduction of new words, characters, sounds, and grammatical structures alien to them. Students have difficulties assimilating the new language. Differences in language structure, pronunciation, and access to language resources are some of the burdens that learners face. Acquiring the language will also be challenging if learners cannot practice it because of a lack of equipment or an appropriate environment. Learning a new language is in demand as the technological era progresses, especially for technology students.

Technology helps learners acquire a foreign language, which improves students' chances of landing a job and boosts their confidence in communication skills. According to the study by Bull and Ma (2001), technology is helpful in language learning.
This study designed and developed an interactive game that can be used in language education to motivate foreign language learners to learn a language while having fun.

2. LITERATURE REVIEW

2.1 Learning Foreign Language

As the world has become a global village, acquiring a foreign language for students has become necessary to be competitive globally as people work with each other worldwide (University of North Georgia, 2023).
Language learning helps students in pursuing their careers, especially in fields in which recruitment is competitive. Companies' efforts to internationalize and have a new language are advantageous and required. It is an outcome of organizations as they become increasingly interconnected with the global economy. Learning a foreign language helps students comprehend their native language as they acquire the syntax, idioms, and peculiarities of a foreign language (Mooc.org, 2021).

2.2. Language Learning in Education

Language is one-way people think, organize their knowledge, express their emotions, and interact with others. People now live in a global community where societies share their culture and identity (Curriculum et al.).
Language learning is vital to educational systems. Future generations must be able to communicate effectively by interacting with people of different cultures in other languages (Dexway, 2023).

2.3. Designing an Interactive Games

Games started in 1952 when British professor A.S. Douglas invented OXO as part of his doctoral dissertation. In 1958, William Higinbotham developed *Tennis for Two* using an analogue computer. Ralph Baer, the Father of Video Games, invented *The Brown Box* in 1972. With the introduction of video games, many inventions followed (History.com, 2022).
As games developed, the array of interactions grew, giving the players a greater in-depth experience and enabling them to have good experiences. According to Artifice (2017), interactivity provides story experiences, mechanics, and the game's environment to the player, thus providing the player with a world made of fantasy. Game interactivity encompasses features that encourage players' engagement. Interactivity improves players' gaming experiences, and an increased gaming experience contributes to greater immersion (University of Silicon Valley, 2019).

2.4. Gamification in the Classroom

Gamification promotes learning and deepens students' comprehension of the subject matter (Haiken, 2021). According to Smiderle et al. (2020), gamification can improve the levels of student engagement akin to what games can do to improve their skills (Smiderie et al., 2020).
Chen and Liang (2022) developed a theoretical model demonstrating how gamification affects students' study engagement. The results showed that via the indirect benefits of enjoyment and self-efficacy, gamification influences students' study engagement.
According to Ozturk and Korkmaz (2019), teaching social studies, which is strengthened by educational games, makes a far larger contribution than the conventional approach to pupils' cooperative learning abilities. Research has shown that educational games enhance education and significantly impact students' academic performance in social studies classes more than the conventional approach.

3. OBJECTIVE OF THE STUDY

This study aimed to design and develop an interactive game for foreign language learning that effectively improves language skills.

3.1. Conceptual Paradigm of the Study

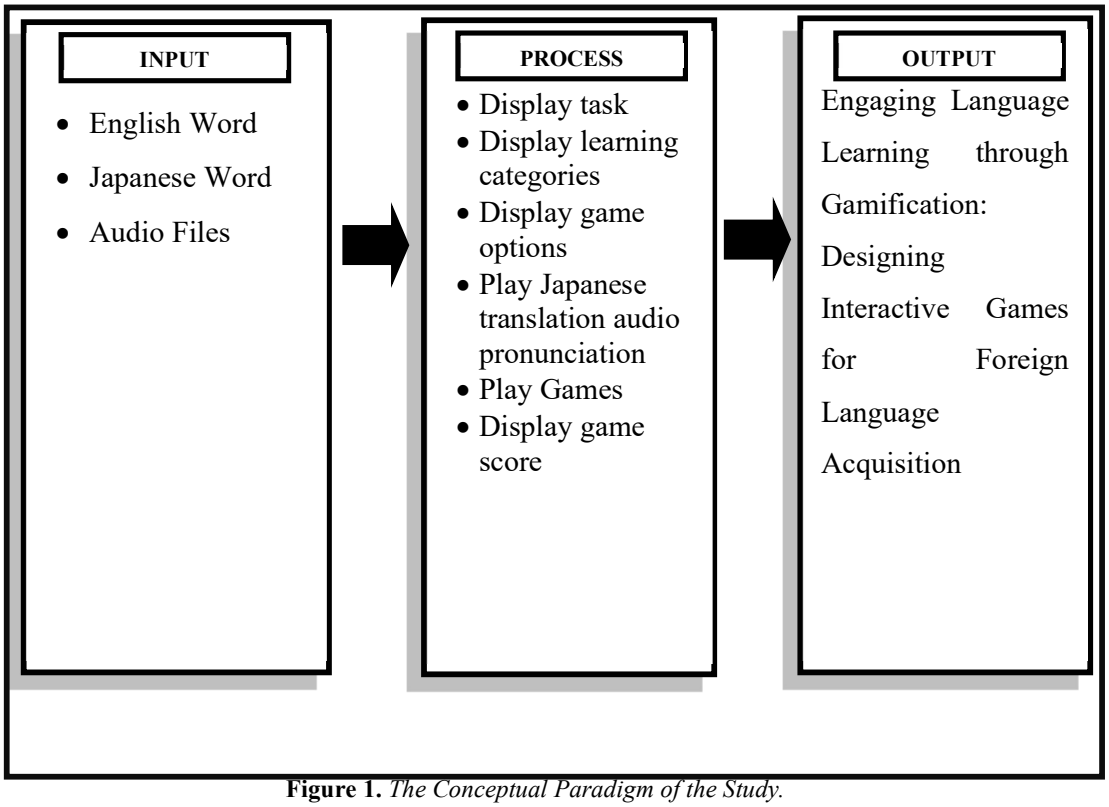

Figure 1. *The Conceptual Paradigm of the Study.*

Figure 1 illustrates the conceptual framework of the study. It is comprised of the input, process, and output. The inputs were English words, Japanese words, and audio files. The process consists of a display of tasks, learning categories, game options, playing of Japanese translation audio pronunciations, playing of games, and displaying the game score. The output includes engaging language, learning through gamification, and designing interactive games for foreign language acquisition.

4. METHODOLOGY

4.1 Project Description

4.1.1. Engaging Language Learning through Gamification: Designing Interactive

Game for Foreign Language Acquisition is a mobile application that can be installed on a phone using an Android API. It was designed for anyone who wants to learn Japanese.

The application has two minimum features: the Learn and Game options. The Learn options include greetings, introducing yourself, occupations, country, people, and language. For the game options, the proponents provide two (2) games, namely Nihongo Brain Tease and Nihongo Quest. The application also provides an opportunity for the learners to learn about the background of the Japanese language through the background page.

4.2. Project Development

This section presents the system's development, features, functionality, and evaluations. A system development methodology refers to the framework used to structure, plan, and control the information system development process. The frameworks have evolved for years, each with recognized strengths and weaknesses.

The Agile Methodology for Mobile Application Development seeks to provide an alternative to traditional project management, such as the waterfall methodology. This approach enables requirements and solutions to evolve through the combined effort of the development team and the customer. It promotes adaptive planning,

evolutionary development, early delivery, and continuous improvement. This iterative and flexible approach can be used in complex projects where customer requirements change frequently (Brush, 2024).

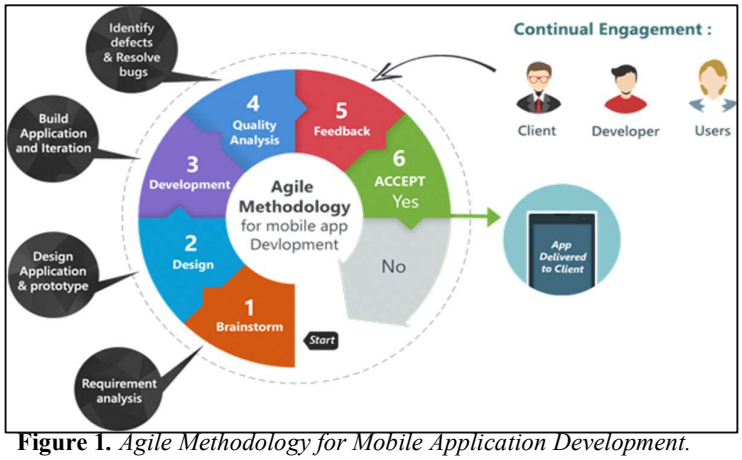

Figure 1. *Agile Methodology for Mobile Application Development.*

Figure 1 shows the steps for the Agile Methodology for Mobile Application Development, which focuses on project iteration and deployment. The phases are the following:

4.2.1. Brainstorm

Brainstorming is a process that includes project identification, requirement analysis, objectives, scopes, limitations, and data-gathering requirements through a preliminary interview with the selected resource person.

This phase includes the preliminary interview and data gathering for the Japanese words used in the application development. Pertinent information, such as Japanese words, Japanese translations of English words, and pronunciation, was identified in this phase. The programming languages, tools, database application, and deployment plan were also identified in this phase.

4.2.2 Design

Design Application and Prototyping. This phase seeks to develop detailed and emphasized specifications of the physical solution to the user's information technology needs. The system requirements and logical description of the entities, relationships, and attributes of the data that were documented during the brainstorming phase were further refined and allocated into system and database design specifications that were organized in a way suitable for implementation within the constraints of a physical environment (e.g., computer, database, facilities).

This phase includes developing the Nihongo Quest design, menus, and functionality. It also includes the design for the screen layout, screen colour, font size, font face, font colour, and icons used in the project.

4.2.3 Development

Build Applications and Iterate. This phase includes coding for the finished design plan during the designing phase. Proper methods and procedures were coded on each object for efficient functionality. The researcher also conducted preliminary testing to identify whether the system provides output based on the users' prescribed requirements.

The proponents developed the application using MIT AppInventor and TinyDB for the database design. Here, the design was implemented in coding and blocking.

4.2.4. Quality Analysis

Identify Defects and Resolve Bugs. This phase includes white box testing and black box testing. For the white box testing, the researcher operationally tested the system's functionality and efficiency. The white box testing included acceptance and system testing. The testing mechanisms identified the defects and resolved any bugs found during and after the system's development. During development, the proponents adopt white box testing to

check for bugs, functionality, navigation, contents, and whether the objectives were met.

4.2.5. Feedback

User satisfaction is the best way for a product to thrive and grow. Users' feedback is one of the critical elements in driving users' satisfaction and system improvement. Feedback from users helps steer the product roadmap, making changes quickly without constantly trying to figure out what is going wrong through statistical or analytical data. All the collected feedback and comments were evaluated in this phase to enhance the system.

For this system, the researchers included a feedback and comment menu so that users can express their opinions regarding its system's functionality, operations, and usability.

4.2.5. Accept

This phase includes deploying the finished application. The researcher plans to deploy the application via the Google Play Store, which is not the only distribution method but is also considered the simplest way to reach millions of potential users.

4.3. Design Specification

The researcher used the Unified Modeling Language (UML) to design the system. The researcher used a UML diagram to construct the application's activity diagram and deployment diagram. The following design specifications are described to illustrate the development of the application:

4.3.1 Activity Diagram

4.3.1.1.Home Screen

The Activity Diagram visually presents a series of actions or control flows in a system. It is a flow chart representing the flow from one activity to another. Each activity can be described as an operation of the system, and the control flow is drawn from one operation to another [42].

The Activity Diagram for the application Home Screen where users can view the Home Screen and the menu buttons.

4.3.1.2. Learn Button

The Learn button houses the categories in which learners can view short lectures about the Japanese language. Once the user clicks either of those buttons, they will be redirected to the actual learning area, where they can study the translation of given English words into Japanese script and words. The Next button will open another set of English-to-Japanese translations in the dashboard.

4.3.1.3. Games Category

The Games category is composed of two (2) games that allow the user to test their learning about the app and challenge their level of learning after using the application.

4.3.1.4. Nihongo Brain Tease

Nihongo Brain Tease is a game that players need to click to start playing. In the menu, the players must input their names. Their score is also displayed along with the timer and the questions.

4.4. Data Gathering Instrument

In this study, the researcher adopted the ISO 20510 Standard Questionnaire and distributed it to domain experts and users for the system's evaluation. This questionnaire set the standards for the software's functional suitability, operability, and portability.

4.4.1. Validity of the Instrument

Validity understood within the context of judging the quality or merit of a study is often referred to as *research*

validity (Gliner & Morgan, 2000)[4]. As a measure of a research instrument or tool, validity is the degree to which it measures what it is supposed to measure (Wan, 2002).

4.4.2. Respondents of the Study

The study's respondents were domain experts and possible users. Table 3 shows the distribution of the study's respondents.

Table 1

Distribution of the Respondents

Classification	Respondents
Students	25
Language Teacher	5
TOTAL	30

Table 1 shows the distribution of respondents. Thirty respondents, 25 students and five language teachers evaluated the testing for the user's survey instrument.

Twenty-five possible students evaluated the games using the survey instrument based on the ISO 25010 standards in terms of its main characteristics, software's functional suitability, operability, and portability based on a random systematic sampling method. The language teachers checked the validity of the Japanese words used in the application. They tested the application functionality, navigation, design, and Japanese words here. After a series of tests, the results show that the application is correct, as validated by the domain experts.

The Roscoe Simple rule of thumb was used to calculate the sample size. According to Roscoe (1975), experimental research with tight controls may be conducted with samples as small as 10 to 20. Thirty or more samples are recommended in most ex post facto and experimental research.

4.4.3. Data Analysis Treatment

The mean and standard deviation were used for the data analysis. The mean was used to determine the system's level of efficiency. It was computed by adding up all the values in the series and dividing the sum of the total number of marks. This paper used the mean for sample sizes of 15 or more [6].

The standard deviation is the most common measure of variation for numerical data in statistics. It measures how concentrated the data are around the mean; the more concentrated the data, the smaller the standard deviation.

The scores were interpreted using the five-point Likert scale, as shown below.

nge	scriptive Rating	erpretation
1 – 5.00	ry Efficient	e application is very effective for the learners.
1 – 4.20	icient	e application is effective for the learners.
1 – 3.40	derately Efficient	e application is moderately practical for the learners.
1 – 2.60	s efficient	e application is less practical for the learners.
0 – 1.80	fficient	e application is not effective for the learners.

4.4.4. Ethical Considerations

Based on the Code of Ethics by Creswell (2009), researchers were required to expect ethical issues that may occur in writing the study. Thus, this study's proponents followed the ethics standards by informing the participants about the study. The study did not divulge the participants' names to protect their identities. They were guaranteed that the information they provided would be confidential and only used for research purposes. After keeping their information for four months, the researchers destroyed the collected data to maintain the confidentiality of the

information.

5. RESULTS AND DISCUSSION

The researchers developed the system using the Unified Modelling Language (UML). The language teachers and the domain experts evaluated the games.

5.1. Evaluation of the Software Quality Standards Based on ISO 25010 by the Users

The software quality evaluation was based on ISO 25010 International Quality Standards. The eight criteria are functional suitability, performance efficiency, compatibility, operability, reliability, security, maintainability, and portability. With this, the proponents used functional suitability, operability, and portability. The developer conducted user acceptance testing (UAT) and evaluation testing with 30 respondents composed of 5 language teachers and 25 students.

The mean and standard deviation (SD) were computed to determine the general perception of IT and Domain experts. A high SD value indicates a wide range of perception, while low values indicate similarity or commonality in their perception.

5.1.1. Functional Suitability

Table 2

Result of the Functional Suitability Quality Characteristic Evaluation of the System

Table 2 shows that the system has a "Very Efficient" functional suitability (M = 4.33, SD = 0.61), which means

ISO 25010 Software Quality Criteria ***A. Functional Suitability***	***M(SD)***	**Description**	**Interpretation**
1. Functional completeness. (The system's set of functions covers all the specified tasks and user objectives.).	4.20(0.63)	Efficient	e application is effective for the learners.
2. Functional correctness. (The system provides the correct results with the needed degree of precision.).	4.30(0.67)	Very Efficient	he application is very effective for the learners.
3. Functional appropriateness. (The system's functions facilitate the accomplishment of specified tasks and objectives.).	4.50(0.53)	Very Efficient	he application is very effective for the learners.
verall Mean	4.33(0.61)	Very Efficient	he application is very effective for the learners.

that the application is very effective for the learners. The functional completeness of the system is "Efficient" (M = 4.20, SD = *0.63*), which means that the application is practical for the learners. The functional correctness is "Very Efficient" (M = 4.3, SD = *0.67*), which shows that the application is very effective for the learners. Lastly, the functional appropriateness is evaluated as "Very Efficient" (M = 4.5, SD = 0.53), which shows that the application is very effective for the learners.

This result means the system fully conforms to the functional suitability standard set by ISO system navigation. It optimizes the use of resources by using sound to translate Japanese words.

This implies that the system is very high-quality in terms of its overall functional suitability and that the application is very effective for the learners.

5.1.2. Operability

Table 3
Result of the Operability Quality Characteristic Evaluation of the System

ISO 25010 Software Quality Criteria ***B. Operability***	***M(SD)***	**Description**	**Interpretation**
1. Appropriateness recognizability. (The users recognize the appropriate need for the system)	4.30 (0.82)	Very Efficient	The application is very effective for the learners.
2. Learnability. (The users can use the system with effectiveness, efficiency, freedom from risk, and satisfaction in a specified context of use to achieve specified goals of learning)	4.50 (0.53)	Very Efficient	The application is very effective for the learners.
3. Operability. (The system is easy to operate and control)	4.60 (0.52)	Very Efficient	The application is very effective for the learners.
4. User error protection. (The system protects users against making errors)	4.50 (0.70)	Very Efficient	The application is very effective for the learners.
5. User interface aesthetics. (The user interface enables pleasing and satisfying interaction for the user)	4.60 (0.70)	Very Efficient	The application is very effective for the learners.
Total	4.50 (0.65)	Very Efficient	The application is very effective for the learners.

As shown in Table 3, the result reveals that the system has a "Very Efficient" operability ($M = 4.50$, $SD = 0.65$), which implies that the application is very effective for the learners. It is because the system has "Very Efficient" appropriateness recognizability ($M = 4.30$, $SD = 0.82$), learnability ($M = 4.5$, $SD = 0.53$), operability ($M = 4.60$, $SD = 0.52$), user error protection ($M = 4.50$, $SD = 0.70$), and user interface aesthetics ($M = 4.60$, $SD = 0.70$) features.

The result implies that the system can be used efficiently, easily, and satisfactorily by different users. However, the system's performance depends on the Android device's hardware specification based on compatibility testing results. The system is designed to be user-friendly based on Android systems' software development principles.

5.1.3. Portability

Table 4
Result of the Portability Quality Characteristic Evaluation of the System

ISO 25010 Software Quality Criteria ***C. Portability***	***M(SD)***	**Description**	**Interpretation**
1. Adaptability (The system can effectively and efficiently be adapted for different or evolving hardware, software, or other operational or usage environments).	4.40(0.70)	Very Efficient	The application is very effective for the learners.
2. Installability (The system can be installed or uninstalled in a specified environment).	4.70(0.48)	Very Efficient	The application is very effective for the learners.

3. Replaceability (The system can replace another specified software product for the same purpose in the same environment).	4.40(0.70)	Very Efficient	ıe application is very effective for the learners.
Total	4.50(0.63)	Very Efficient	ıe application is very effective for the learners.

Table 4 reveals that the system has "Very Efficient" portability (M = 4.50, SD = 0.63), which implies that the application is very effective for the learners. The system has "Very Efficient" adaptability (M = 4.40, SD = 0.70), installability (M = 4.70, SD = 0.48), and replaceability (M = 4.40, SD = 0.70) features. Overall, the application is very effective for the learners.

The result implies that the system can efficiently adapt to different environments, replace old software using similar hardware specifications, and can be easily deployed or retracted.

The study agrees with the article written by Smith (2022) regarding "Android Studio," which mentioned that Android Studio provides an adaptive application framework that provides unique resources for different system configurations. World-class code editing, debugging, performance tooling, and an instant build/deploy system allow the developer to focus on building a high-quality system. This framework has significantly helped the researcher of this system to complete a portable mobile system. Although some platform environments cannot support the system like those mobile devices run by Apple iOS, mobile phone users worldwide use Android operating systems and devices. Thus, it was indicated in the recommendation of this study that the Apple iOS environment may be considered in the future so that the portability characteristic of the system will become complete.

5.2. Summary of the Results

Table 5

Summary of Result of the Quality Characteristics Evaluation of the System Based on the ISO 25010 International Standards

ISO 25010 Software Quality Criteria	*M(SD)*	Description	Interpretation
A. Functional Suitability	4.33(0.61)	Very Efficient	he application is very effective for the learners.
B. Operability	4.50(0.65)	Very Efficient	he application is very effective for the learners.
C. Portability	4.50(0.63)	Very Efficient	he application is very effective for the learners.
Total	**4.44(0.63)**	**Very Efficient**	he application is very effective for the learners.

Table 5 summarizes the results of the system's quality characteristics evaluation based on the ISO 25010 international standards.

The results reveal that the respondents found the system "Very Efficient" (M = 4.44, SD = 0.63) and conformed to the ISO International Quality Standard. It shows that the application is very effective for Japanese language learners (Nihongo).

Specifically, the respondents found the system "Very Efficient" on its functional suitability (M = 4.33, SD = 0.61), operability (M = 4.50, SD = 0.65), and portability (M = 4.50, SD = 0.63) characteristics.

This result shows that the system met all the criteria and conformed to the international standards of ISO 25010

on functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability.

The results imply that the system is of good quality and could provide quality service to its beneficiaries whether or not they have an internet connection, which suggests an assurance that the system operates efficiently.

The study's results agree with ISO 25050's provision that only quality software products must be deployed to stakeholders. To ensure the value of these software products, a comprehensive specification and evaluation of the quality of software and software-intensive computer systems must be done.

6. CONCLUSION

This research shows the potential of designing games for foreign language learning. Through the creation of interactive games, this study demonstrates how gamification can improve the engagement, motivation, and effectiveness of foreign language acquisition. The innovative game can be a pedagogical strategy for employment inside or outside the classroom. This research shows the fascinating avenue of employing gamification as a dynamic means to support a more engaging and fruitful learning experience by interconnecting language learning with games. It is an approach for a more interactive, enjoyable, and effective learning journey for language learners.

7. RECOMMENDATIONS

Students should use the new mobile app to practice the language, reinforcing their acquisition of the target language while having fun.

Foreign language instructors should integrate gamification in teaching a foreign language to increase motivation and engagement, enhance retention of language concepts, and create a positive learning environment.

University administration should integrate games into the language learning curriculum to further enhance technology use. They should also invest in training programs to equip teachers with the skills and knowledge necessary to effectively incorporate gamification into their teaching approaches.

Future researchers should use this study as a baseline for creating new gamification apps. They should enhance the game features or elements of the mobile applications.

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