

Development of E-Learning System for Learning Japanese Based on Gamification Theory and Measurement of its Effect

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1. Introduction

Japanese is one of the world's most difficult language [1]. Learning Japanese is difficult for people with native language that does not use kanji [1] [2]. This is caused by the big difference between the writing and reading system of kanji with their native languages [1]. In Japanese writing system, hiragana, katakana, and kanji are used simultaneously [1] [3]. Katakana and hiragana are composed of 46 characters with some similarly looking characters that foreign students find hard to differentiate [4] [5]. However, learning kanji is even harder and more complicated than hiragana and katakana [1] [2]. Mainly because there are numerous counts of kanji each with several meanings and readings [4]. Based on Japan Ministry of Education, Culture, Sports, Science and Technology (MEXT), there are 2316 required *jōyō* kanji as of 2010 [6]. As such, foreign students often have trouble in kanji acquisition [1] [2].

E-learning is a computer-based education tool or system that enables someone to learn anywhere and anytime [7]. The e-learning market is steadily expanding with the increase use of smartphones, tablets, wearable technologies, and mobile devices [8]. Current learners grew up with technology and have different approach in learning [9]. This posed as a challenge to teachers as they need to use

different teaching method to allow students to be active participants with strong motivation and engagement to their own learning [9].

Using gamification has been used to increase users' participation and motivation by incorporating game elements such as point, leaderboards, and giving immediate feedback as cited by [10]. According to [9], implementing game techniques and mechanisms in learning could be done to achieve certain learning objectives, increase learners' motivation to complete the objectives and engage students in a friendly competitive environment with other learners.

As of November 20, 2019, there are many e-learning systems to learn Japanese in the Play Store and App Store. However, they are lacking in the handwritten input feature to practice writing. For example, Memrise¹ and Duolingo². These two applications provide exercises in multiple choices or fill in the blanks model. As for Japanese Kanji Study³, the Android version provides a handwritten input for writing challenges, but the iOS version does not include this feature.

Lastly, in order to measure the effectiveness of the e-learning system based in gamification theory, ARCS model will be used. ARCS model of motivation includes four areas for promoting and sustaining motivation in learning process: Attention, Relevance, Confidence, and

¹ <https://www.memrise.com/>

² <https://www.duolingo.com/>

³ <https://play.google.com/store/apps/details?id=com.mindtwisted.kanjistudy&hl=en>

Satisfaction.

Therefore, this research proposes to develop an e-learning system to aid in learning Japanese based on gamification theory and to measure its effect by using ARCS model.

2. Hypothesis

The proposed e-learning system improves user's Japanese language ability to know at least 160 kanji and measure attention, relevance, confidence, and satisfaction level with ARCS model.

3. Goals

To develop e-learning system for learning Japanese based on gamification method and measure its effectiveness. The system includes:

- Using the developed e-learning application, users are able to improve their Japanese skill proficiency in understanding kanji, vocabulary, and the usage in sentence.
- The developed e-learning application provides enjoyable learning experience.

4. Literature Study

4.1. Gamification

Gamification is an integration of game elements and game thinking in activities that are not games [9]. The game elements are described in Table 1.

No.	Game Elements	Description
1.	Points	Numeric accumulation based on certain activities..
2.	Badges	Visual representation of achievements for the use shown online.
3.	Leaderboards	How the players are ranked based on success.
4.	Progress bars/Progression	Shows the status of a player.
5.	Performance graph	Shows player performance.
6.	Quests	Some of the tasks players have to fulfill in a game.
7.	Levels	A section or part of the game
8.	Avatars	Visual representation of a player or alter ego.

9.	Social elements	Relationships with other user through the game.
10.	Rewards/reward system	System to motivate players that accomplish a quest.

Table 1. Game Elements [10]

The advantage of implementing gamification in activities and processes is that it promotes higher level of commitment and motivation of users [9]. While gamification is not directly associated with knowledge and skills, gamification affects students' behavior, commitment and motivation. Which according to Huang and Soman, can lead to improvement of knowledge and skills as cited by [9].

4.2 ARCS Model

ARCS model of motivation includes four areas for promoting and sustaining motivation in learning process: Attention, Relevance, Confidence, and Satisfaction.

5. System Development

5.1 Development Environment

The e-learning system will be developed for smartphones with operating system Android and iOS. The development will be carried by using Ionic framework and programming language Typescript.

5.2 System Flow

The system will be comprised of three main learning menus, Kanji, Vocabulary, and Sentence. In addition, there is a My Word List menu for user's favorited word and a PvP (Player vs Player) menu. Figure 1 shows the Main Menu and the corresponding game elements based on Table 1. The fifth game element, performance graph, is not shown as it is part of the profile screen.

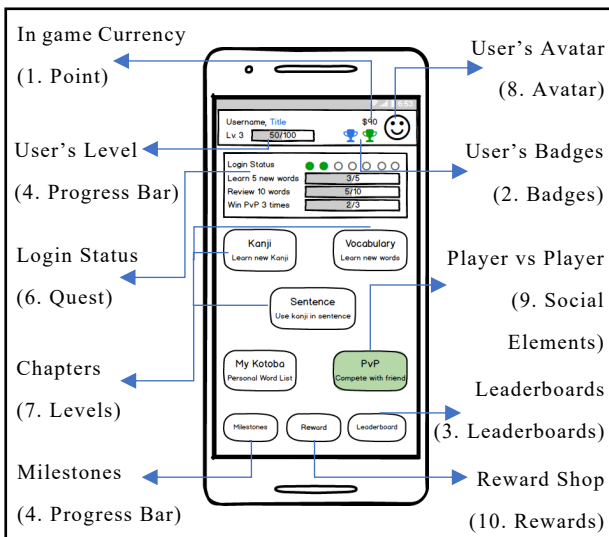


Figure 1. Main Menu and Game Elements

The Kanji menu consists of individual kanji characters provided with the reading, stroke order, meaning, and example words. There is canvas in the middle of the screen for the user to practice handwriting. The system will be able to judge whether the handwriting is correct or incorrect. The Kanji menu is shown in Figure 2.

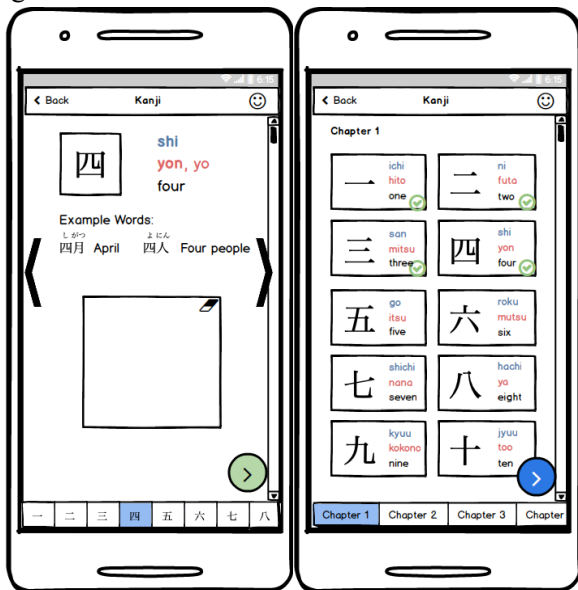


Figure 2. Kanji Menu

The Vocabulary menu consists of words categorized in chapters with similar meanings or usages. Just like the Kanji menu, there is canvas to for user to practice writing and the system will give feedback. The Vocabulary menu is shown in Figure 3.

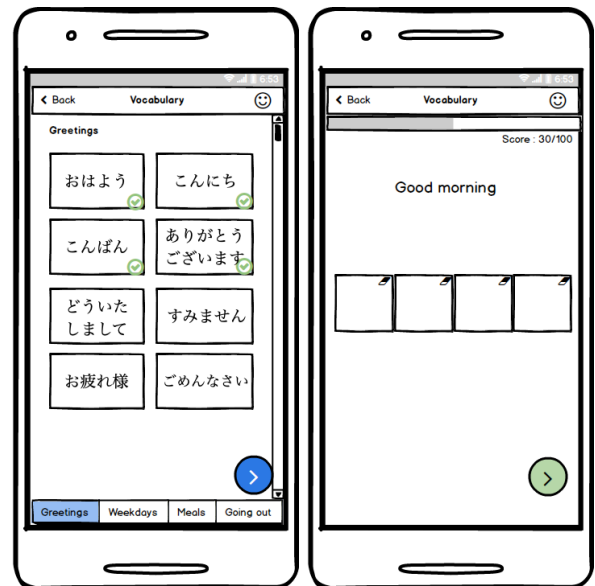


Figure 3. Vocabulary Menu

The Sentence menu consists of how to use the words in Vocabulary menu correctly in a sentence. Similar to Kanji menu and Vocabulary menu, the sentence menu features writing in canvas as the means of answering. The Sentence menu is shown in Figure 4.

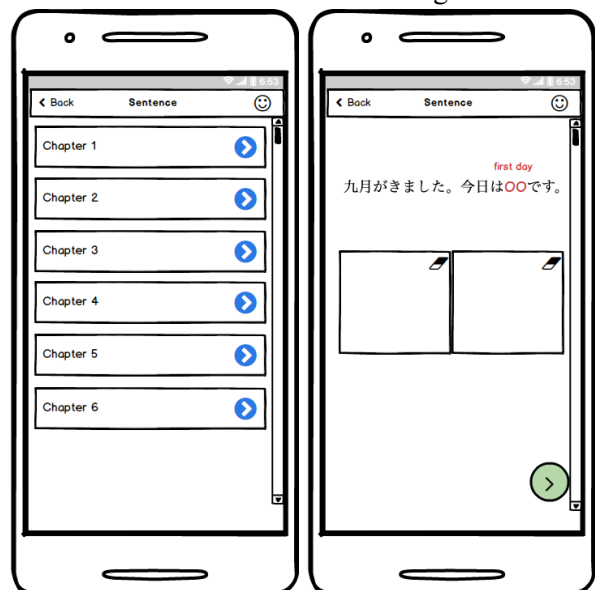


Figure 4. Sentence Menu

The PvP menu enables user to compete with each other by answering quizzes. The one with faster time and correct answer will win. However, there are several items that user can use to boost own's progress or hinder opponent's progress. The points will be shown in Leaderboard menu. The PvP menu and Leaderboard are shown in Figure 5.

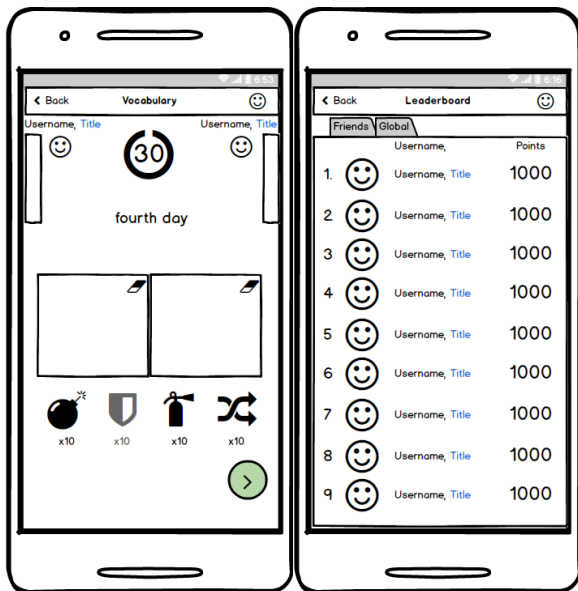


Figure 5. PvP and Leaderboard

Based on user's progress, the milestones will track the user's achievement. Unlocking the milestones will grant the user's new badges and titles. Practicing also grants the user in game currency which could be used to buy self-customization reward, such as avatar frames and themes. The Milestones and Reward Shop are shown in Figure 6.



Figure 6. Milestones and Reward Shop

6. Future Work

This research will be continued on to the next stage, development of the system according to the described flow in section 5. This will be accompanied by testing and debugging parallelly. After completing the development process, the system effectiveness will be evaluated based on ARCS model.

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