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# Dragon Tale – A Serious Game for Learning Japanese Kanji

**David A. Plecher<sup>a</sup>**  
Plecher@in.tum.de

**Christian Eichhorn<sup>a</sup>**  
Christian.Eichhorn@tum.de

**Janosch Kindl<sup>a</sup>**  
Janoschkindl@gmail.com

**Stefan Kreisig<sup>a</sup>**  
s.kreisig@web.de

**Monika Wintergerst<sup>a</sup>**  
Monika.wintergerst@tum.de

**Gudrun Klinker<sup>a</sup>**  
Klinker@in.tum.de

<sup>a</sup>Technical University of Munich  
Chair for Computer Aided Medical  
Procedures & Augmented Reality  
Institute for Informatics / I16,  
D-85748 Garching b. München,  
Germany

## Abstract

To counter the difficult task of studying kanji when learning the Japanese language, we suggest an adventure style Serious Game. Previous solutions are focused on small 2D games or gamification of virtual kanji trainers. Our goal is to utilize the concept of *flow* by immersing the player in a rich storyline with Japanese mythology, turn-based encounters and various mini games to train all aspects of kanji: stroke order, meaning, pronunciations and compound words. We further introduce Augmented Reality to the language acquisition as an innovative way to combine virtual content with the real world. A first test revealed great potential of such an approach and feedback for further development.

## Author Keywords

Serious Game; Language; Japanese; Kanji; Augmented Reality; Knowledge Transfer; Mobile Devices; Role Playing Game

## Introduction

The core aspect of a game is enjoyment and for *digital games* some useful factors have been identified like a rich storyline in an interactive game world, which allows to put the player into a state of *flow* [2]. Fully submerged, the player will be only concentrated on the game activity (*flow zone*), which can be used for other

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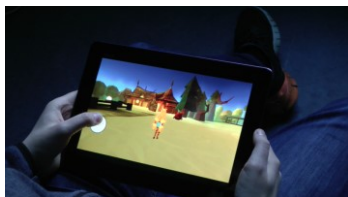
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### Connection between dragons and kanji

Since ancient times dragons play a major role in Chinese mythology. Emperors were influenced by their actions and major incidents occurred when a dragon appeared. They were an important part of the general understanding by those people even influencing the creation of the early Chinese characters [1].



**Figure 1:** Dragon Tale, a mystical adventure to learn Japanese kanji

Games are intrinsically (from the inner self of the player) motivating by offering challenging experiences bound by rules with the goal to reach an identifiable outcome [2]. *But how can the concept of a game evolve to overcome the challenge of learning a language?*

purposes than pure entertainment [4]. For Dörner et al. [2] such games with the intention to benefit the player with e.g. learning progress or healthcare are called *Serious Games*. There are many types of *Serious Games* possible like sports games or adventure games. In the Dragon Tale project, we are looking at the goal to learn a new language, a narrative approach with rich interactions to acquire skills and collecting items (kanji), core concepts of an adventure game, seems to be benefitting [5]. *What are traditional methods and other existing Serious Game concepts delivering in the area of learning the Japanese language?*

### Classic approaches

The usage of virtual vocabulary and kanji trainers is popular on mobile platforms. In recent times developers try to differentiate themselves with playful approaches, including puzzle/quiz games, pronunciation from native speakers and data analysis to visualize the learning progress. Popular examples for learning Japanese are *Duolingo* [14], *Language Learning* [15], *Learn Japanese* [16] or the website *easyJapanese.org* [17]. While for some people a pleasant and playful look with simple 2D representations of traditional quiz games are enough, it is hard to achieve a continuous sense of *flow*. Such concepts are not described as *Serious Games*, but as *Gamification*, which “is the transfer of game methodologies or elements to non-game applications and processes” [2, p. 3].

### Dragon Tale: Principal approach

Dragon Tale is the prototype of a serious game, combining learning Japanese with entertainment. The main focus is on learning kanji, logographical characters borrowed from the Chinese language. To support the learning process, the game incorporates

elements of Japanese culture like mythical creatures or ancient tales. Furthermore, inspirations out of well-known game genres and their concepts have been taken and reinterpreted to support a learning approach by focusing on an adventure style experience. Players will recognize similar concepts from existing Role-Playing Games (RPG) with a focus on exploring and playful interactions. The result is a unique story-driven adventure game with tactical turn-based encounters. Device of choice are tablets because of their intuitive large touchscreens to draw kanji and the possibility to use gestures (see Figure 1). The game consists of 5 levels with various mini-games, including an Augmented Reality (AR) puzzle game. Thereby it is possible to freely walk through a level to explore the several sceneries or revisit some of the learned lectures. The player can learn various groups of kanji and their aspects: the stroke order, meanings, pronunciations and compounds.

### Aspects of learning kanji

Besides learning vocabulary and grammar in the Japanese language, students face the challenge to learn kanji (the equivalent to written words). They consist of around 200 radicals (*bushu*). A radical is similar to a letter of the alphabet and has no meaning of its own. Therefore, radicals are learned in the context of kanji. For the pronunciation hiragana (syllables) is used and one kanji can have multiple pronunciations. To summarize, the kanji learning process can be described in four tasks:

- The need to learn at least 2.000 kanji
- Learning stroke orders for a balanced handwriting

Serious Games focusing on language acquisition

Dragon Tale is not the first *Serious Game* which focuses on trying to catch a person in the *flow* when learning Japanese with adventure and enjoyment. There were several basic *Serious Games* developed like the RPG *Slime Forest Adventure* [6]. Other 2D games focus on an interactive storyline with e.g. collecting quest items like *Kanji Corporation* [7], *Learn Japanese to Survive!* [8] or *Slashcards: Learn Japanese* [9]. Those approaches allow more diversity than traditional Jump ‘n’ Run games, e.g. *Hanjamaru* [10]. As the Japanese language gained popularity with the anime and manga genre, larger games like *Kawaii Nihongo* [11] and *Kanji no Owari* [12] emerged. The Kickstarter project *Koe (声)* [13] is a long-awaited story-driven RPG to learn the Japanese language focusing on vocabulary, grammar and kanji.

- Remembering different meanings as their pronunciations
- Combining kanji to words, so called compounds (jukugo)

The game teaches basic kanji belonging to the recommended beginner set required for proficiency N5 [3]. Those kanji are important in daily life and can be used for compounds to form multiple Japanese words, e.g. the names of week days. Optimally, the player has already learned hiragana to be able to understand the meaning behind the words.

Serious Games in the form of an interactive adventure?

Title	3D world	Story	Turn-based	AR	Myths
Slime Forest Adventure		X	X		
Kanji Corporation		X			
Learn Japanese to Survive!		X	X		
Slashcards: Learn Japanese	X				
Hanjamaru		X			
Kawaii Nihongo		X			X
Kanji no Owari	X	X	(X)		X
Koe (声)	X	X	X		(X)
MondlyAR	X			X	
Dragon Tale	X	X	X	X	X

Table 1: Various competitors in comparison to Dragon Tale

When comparing Dragon Tale to the competition, games like *Kanji no Owari* [12] or *Koe (声)* [13] deliver comparable depth and feature diversity. Nevertheless, there are still some unique focus points (see Table 1) like a moral- and Japanese mythology-based storyline

and a versatile turn-based design with a deep integration of mini games into the story (e.g. drawing a specific kanji to solve the task) which goes further than the superficial approach of tapping on words in other RPGs. Another major feature is the still sparsely used idea of incorporating AR despite the possibility to connect virtual content with the real world and the various existing AR education games [18]. The only other existing concept *MondlyAR* [19] focuses on real size virtual object interactions and conversations with a virtual assistant.

Dragon Tale – Storyline

A long time ago, people shared a deep bond with dragons. They protected the people with their powerful spells from other magical creatures like imps and spirits. Humans worshiped the dragons as wise creatures and everyone lived a peaceful life in harmony. Communication between people and dragons was done with an ancient language (kanji). Unfortunately, one day two rivaling human clans started a war and tried to use the powerful magical spells of the dragons for their advantage. The dragons despised war and cruelty, but two young dragons got carried away and involved themselves in the war, resulting in their deaths. After that incident, the dragons left humanity alone and are hiding since then, only legends remained.

Basic game mechanics

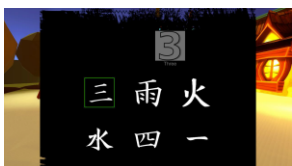
When touching on the character a menu appears. The button “Quest” will give hints for the story and the button “Dictionary” opens a view with all the currently encountered kanji with the option to start the Drawing Game (see Figure 2). The last button is called “Puzzle” and will open the Quiz Game (see Figure 4) view and



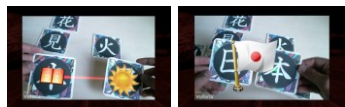
**Figure 2:** Drawing Game



**Figure 3:** Enemy encounter



**Figure 4:** Quiz Game



**Figure 5:** AR Puzzle Game, on the left wrong combination (Book + Sun) and on the right correct pairing (Sun + Book = Japan)



**Figure 6:** Reading Game

the player can frequently train the ability to memorize the meanings of all the introduced kanji.

The battle concept is turn-based with the addition, that the player has the option to counter enemy attacks (see Figure 3). To attack an enemy or for defense, the player selects a kanji from the bar and draws it with the correct stroke order (Drawing Game). The meaning of the drawn kanji will be translated into a corresponding attack by the dragon, e.g. if the kanji for fire has been drawn, the dragon will launch a fire attack on the enemy. If the enemy launches an attack, the player receives a hint what type has been chosen and can defend the dragon by simply selecting the correct kanji in the selection bar within a limited timeframe. The attack type has to be chosen carefully, as certain types are not useful against some enemies, e.g. fire against a fire opponent will be ineffective, water should be used.

### **Drawing Game – What is the correct stroke order?**

The Drawing Game helps the player to memorize the stroke order through repetitive training without the frustration behind such an approach. There are two options for the player to write kanji: A new kanji has been discovered by playing through the storyline and secondly, when the player uses the "Dictionary" menu option to cast a spell to fight an enemy. The player has to repeat the kanji with the correct stroke order and direction of the strokes (see Figure 2). If a stroke is incorrect, the player will see the animation for the following stroke as hint.

### **Quiz Game – What does the kanji mean?**

This mini game can be accessed anytime via the game menu. Six kanji are shown to the player and a picture

with a description which kanji should be selected. If the answer is correct, the picture and kanji are highlighted in green and disappear (see Figure 4). The goal is to gain confidence about the meanings of kanji and when the player scores low, the quiz has to be retaken. To improve the learning success, the game logic will show well-known kanji much less.

### **AR Puzzle Game – How to build advanced words in Japanese?**

The player prints out some marker cards with kanji printed on top of it. Depending on the situation, the player will get a task to find a compound word (jukugo), a Japanese word consisting out of two or more kanji. The player can hold a marker in front of the camera and a virtual representation of its meaning will be visible. The task is now to find kanji cards, which can be combined to a new meaning. To support the player, if the markers are in the wrong order, a virtual, red line will appear (see Figure 5, left side), while green lines will symbolize a successful pairing. If the correct order has been found, the combined word's meaning will be shown as a new, virtual object on the screen (see Figure 5, right side). The player can only encounter already learned kanji and their pronunciations. Because of that limitation, this mini game will be introduced at the end of the storyline to defeat the final group of villains.

### **Reading Game – What different pronunciations does the kanji have?**

This mini game focuses on teaching the pronunciations of kanji and is similar to *Slime Forest Adventure* (LRNJ 2018), where the player defeats slimes with kanji on the back by inputting their correct translation. But there is a difference, the player enters the

## Main characters



**Yuni (player character):** A young woman living in a small fishing village at the coast of Japan.



**Ryū:** A dragon baby belonging to an ancient tribe with magical powers (spells). But communication is not so easy, the dragon does only understand ancient words (kanji).



**Katakiyaku (villain):** An arrogant heir of a wealthy family who wants to steal the magical dragon with any means necessary.



**Figure 7:** The full storyline consisting out of 5 levels in three open environments. Throughout the journey new challenges, characters and mini games allow for a diverse experience to keep up the *flow* and encourage the learning process.

*Source: Map designed by Kaohua Liu with Inkarnate map editor*

pronunciation instead of the translation by dragging the correct Japanese hiragana out of a pool into a predefined slot. The opponents are represented as samurai with different kanji over their heads. If a syllable has been entered at the correct location, it is marked green and the samurai loses stamina (see Figure 6). If the syllable has been dragged into the wrong slot, it turns red and the player gets attacked.

### Level 1 – Finding the initial kanji

Yuni finds a mysterious egg on the beach from which the small dragon (Ryū) hatches. To get information, Yuni meets the village's elder, who gives her the task to

find scripts about the ancient language to interact with the dragon. But a lightning strike hits the tree in the village center and sets it on fire. To save the village, the magical spells learned by the dragon will be used (Drawing Game) to extinguish the fire. After finishing several tasks to learn more about ancient words (Quiz Game) and having established a bond with the dragon, Yuni makes up her mind and is going on a journey to bring Ryū to his family (see Figure 7).

### Level 2 – First turn-based kanji challenge

Yuni and Ryū are entering a forest where they meet a man in trouble. The next task can be solved by using

### **First, small study in three stages:**

1. **Questionnaire (pre-test):** Knowledge of Japanese language
2. **Playing the game:** Testing level 1, 2 and 5
3. **Questionnaire (post-test):** Questions (*pre-test*), AR and mini game integration

### **13 participants (students; 6 beginners, 7 advanced):**

- The 6 beginners improved noticeably: 12 errors (*pre-test*) vs. 4 errors (*post-test*)
- The game has been found entertaining by (11/13)
- Integration of the AR feature was perceived to improve the learning experience noticeably (9/13)
- All 13 agreed on the good integration of the mini games
- Criticism focused on the limited number of kanji and currently it is not possible to learn Japanese from scratch (hiragana and grammar)
- The overall results were promising, as the fun environment allowed to easily remember the learned kanji

some of the learned kanji as spells. Jealous about the magical creature, the man wants to buy the dragon from Yuni, but she declines. The character turns out to be a villain and attacks Yuni. Using the learned kanji for defense (Drawing Game), the team can fight back (see Figure 3). After defeating the opponent, they hear a voice which is telling them to search for a small hut.

### **Level 3 + 4 – Knowledge and friendship**

Yuni and Ryū find the small hut. By learning new ancient words, the player can turn the day into night and the witch Awasōbaba appears. To earn her trust, they have to search for her treasure and find new kanji. After succeeding, the player learns about the sad story behind the disappearance of all dragons. The player will learn the kanji for friend. Awasōbaba sends Yuni back to her village to meet the village's elder. He has found a correlation between the disappearance of the dragons and the documentation of an island just off the coast. Arriving on the island, Yuni and Ryū find a wall and by using the learned kanji for friend as key, it disappears.

### **Level 5 – The true essence behind words**

In the cave four riddles (AR Puzzle Game) have to be solved to summon the gatekeeper. After solving them, the old dragon Mizuchi (gatekeeper) appears. The dragon tells Yuni her true name, *Shujinkō* (hero). Furthermore, he explains her the power behind knowing the real name of a being (*true essence*) and the responsibility following with it. Katakiyaku appears and tries to capture all the dragons hiding in the cave, but with the knowledge of the true name, Yuni and Ryū are taking on the fight. After finding and spelling the names (Reading Game) of all the enemies, they get defeated (see Figure 6). Mizuchi decides it is time for the dragons to take their place in the world again.

### **Results and future work**

Starting off with the idea of designing an entertaining and unique learning experience for a difficult aspect of the Japanese language, learning kanji, Dragon Tale shows great potential (see study on the left side). The current focus is on writing (Drawing Game), meaning (Quiz Game, AR Puzzle Game) and reading (Reading Game) of kanji. In the future we want to extend the game to reach players who want to start learning the Japanese language from scratch by adding content for studying hiragana and basic grammar. Another focus point will be the refinement of the existing mini games with the collected feedback. We plan to enhance the potential for the player to interact with Ryū by looking after him on daily basis (similar to Tamagotchi), e.g. using food related kanji to feed him. The battle system will be improved with dynamic encounters, allowing to fight suddenly appearing creatures (Japanese folklore) to make traveling more diverse. Furthermore, the skill of the player should have a noticeable effect on the outcome of a spell. For that reason, after learning the stroke order of a kanji, speed and precision when drawing it will correlate with the attack strength of a spell. Another focus point will be on bringing the learning experience into the real world by extending the AR feature. The creation of physical training cards with markerless AR by detecting written kanji could be a way to improve handwriting. Combining RPG elements, a fun storyline (inspired by Japanese mythology) with language acquisition methods, resulted in a promising *Serious Game*, not only for beginners.

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Map: Inkarnate (<https://inkarnate.com>)

Unity-chan model: © Unity Technologies Japan/UCL