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Gamified Learning: Using Narrative to Enhance Second Language Learning

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Abstract Gamification, defined as utilizing game elements in non-game contexts, has been applied in different ways within various fields. Earlier research has investigated the effectiveness of gamification in education and has found useful effects, such as improving competence, need satisfaction and learning efficiency [1, 2]. Evidence suggests that narrative can be useful in improving the motivation for learning and connected outcomes. However, the language learning application of narrative as a gamification element has not yet been studied. This research focuses on narrative as one type of gamification and investigates its impact on a language learning case study. 48 participants were invited to learn the artificial, minimalistic language “Toki Pona.” Participants were divided into two groups, with one group learning with narrative elements and one without. The results show no significant difference that narrative can function as a gamification element for language learning. The paper discusses possible explanations, as well as potential improvements of the experiment.

Keywords:

Gamification, gamified learning, e-learning, narrative, motivation

Introduction

Although the term “gamification” sounds quite new as it first came up online in 2008 [3] and has been widely used from 2010 since a set of presentations expatiated the idea of gamification for the public, the core concept of “gamification” has been widely applied to different aspects of life for many years. Applying gamification in learning and training has always been a hot category in both education and gamification. Prior research addressed the use of gamification in the process of learning to enhance students’ engagement and motivation. By tracking research on the use of games in education, four larger thematic areas can be found in those investigations: educational games, game-based learning (GBL), serious games, and educational gamification. Unlike the first three areas, which take games as a teaching medium and environment, educational gamification aims to inspire students’ interest in learning through the utilization of game elements or methods into teaching process so that students can promote their learning effectiveness as well as obtain a pleasant learning experience [4]. Compared with the first three areas which focus more on

designing tools, the design thinking is more valued in educational gamification. Integrate design thinking with existing tools is easier to start and lower-cost. Combined with the concept of gamification, that is “as the use of game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” [5], this paper defines gamification of learning as follows: **Gamification of learning is an educational method that applies the game elements and game thinking into the learning process to promote students learning.**

With the development of the Internet, young learners belong to a generation that is described as “digital natives” [6], characterized by having different learning styles and attitudes towards the learning process. Instead of taking conventional classes with face-to-face practice, e-learning is a highly autonomous learning practice. In such a learning environment that lacks constraints and timely support from teachers, as well as the competence and collaboration between partners, stronger motivation must be needed for effective e-learning. To motivate and maintain the motivation of e-learning, many learning

applications consider gamification as a potential way, trying to use game elements and mechanisms to design online learning, such as Duolingo, Kahoot, Unlock Your Brain, etc. However, most gamification cases currently mainly focus on studying the effect of points, badges and leaderboards system (PBLs), but rarely focus on other game elements. Thus, more directions of gamification could be explored as new possibilities, such as narrative and characters.

Considering narrative is a practical and powerful teaching tool, especially for language learning [7], There is potential in exploring the effectiveness of using narrative for language learning. Yang and Wu illustrated that Digital-Storytelling participants performed significantly better than lecture-type participants in terms of academic achievement, critical thinking, and learning motivation when learning a foreign language [8]. Tsou et al. found that integrating digital storytelling into the language curriculum can improve students' level of learning in reading, writing, speaking and listening by developing a multimedia storytelling website [9]. However, most of the studies discuss narrative only in combination with other game elements, such as

animation and puzzles [10]. The main effects of narrative are still unclear. Before the integration of various game elements, a necessary step to understand and determine the main effects of an isolated game element is omitted [11, 12]. As a result, more studies about understanding how game elements effect in isolation (e.g., narrative) need to be done. Moreover, Borges et al. indicated that gamification had mostly been applied in approaches to teaching students in higher education, and there is few empirical research about gamification in language learning [13].

The primary research goal of this paper is to fill this gap and to explore the effect of using narrative in language learning in regards to effectiveness, motivation and learning satisfaction. Hereby, the following research questions are proposed:

Question 1: Does the use of narrative elements help improve the performance of language learning?

Question 2: Does the use of narrative elements help to enhance the interest/enjoyment of users?

Research Significance

Gamification of learning in the digital environment is a relatively new area of research. Can gamification truly improve learning effectiveness, and how well can learning processes integrate with game elements or mechanics? Within the field of gamification, what are the impacts of gamified learning environments on students' learning behaviors and attitudes? This research revolved around one specific game element: narrative. Through theoretical analysis and experimental verification, these issues were thoroughly discussed and studied, which provided a certain reference value for the development and perfection of gamified learning theory. In practice, through the experiment's design, this research also provided a certain reference for gamified language learning applications while using a narrative element.

Research Content

This research focuses on the role of narrative in digital language learning.

1. Design of a gamified language learning web platform, which focuses on narrative elements. The story/narrative used in this experiment follows the structure of the "Hero's Journey," which

provides a basic structure for telling stories. The experimental group uses the gamified web platform for language learning, whereas the control group uses a web platform without narrative element for language learning. After the experiment, relevant data is collected and compared between the experimental group and the control group to draw conclusions.

2. Analysis and summarization of key factors that influence the effectiveness during this gamified language e-learning process.

Related Work

Concept of Gamification

Each researcher defines the "gamification" based on their own understanding that causes their interpretations are similar but slightly different. After the term "gamification" has been known since 2010, the definition proposed by Deterding in 2011 was widely recognized as "using game elements in non-game contexts" [14]. Werbach extracted three key factors from this definition: game elements, game design techniques and a non-game context [14, 15]. This definition makes a

conceptual distinction between gamification and serious game. Unlike serious games, which are designed for a specific purpose related to training and possess all game elements, gamification aims to increase motivation and commitment, even to influence user behavior only by meaningful combinations of limited game elements [17-19]. However, this definition does not explain the purpose of gamification. De-Marcos et al. proposed the definition of gamification as “the use of game elements and game design techniques in non-game contexts to engage people and solve problems” [20]. Hence, the purpose of educational gamification is defined as improving motivation and learning effectiveness in this research.

Educational Gamification

In the early stages, with the rise of video games, people realized that video games could be applied to learning to improve students' interest in learning. Researchers have tried to apply video games (such as “Civilization” and “Sim City”) to school education [21]. With the further popularization of the Internet and digital games, people are trying to apply design elements and concepts of games rather

than using games in their entirety for education. Existing research has shown the efficiency of gamification in education.

Hwang et al. found that the playing games benefited the students' learning achievement and motivation in improving English listening performance [1]. Elisa et al. suggested that using points, levels, and leaderboards can promote performance in a particular study context [22]. The conclusion from Domínguez et al. also indicated the badges did have a positive effect on practical assignments and overall learning performance [23]. Although their findings also indicated a negative effect on written assignments and students' participation rate.

In 1981, Malone proposed the term “intrinsic motivation” by studying the motivation of users while they were using computer games [24]. Research on intrinsic motivation provides a theoretical basis for improving user interests. In the theory of gamified learning, gamification is intended to affect learning-related behaviors or attitudes [19]. Contrary to the serious games' approach, which is typically intended to affect learning, gamification

can lead to the improvement of learning outcomes by affecting learning-related behaviors and attitudes [25]. This is the reason why intrinsic motivation and gamification are regarded as closely related. Students' motivation for learning is particularly significant for education. The reason why educational gamification is controversial is that some studies have shown that gamified learning can damage students' intrinsic motivation while other studies suggest appropriate extrinsic motivators help students feel more competent and then enhance their intrinsic motivation [26]. Points, badges, and leaderboards (PBLs) are widely used in gamified applications due to their low-cost and ease of implementation. However, some researchers argued that applying PBLs can be harmful to intrinsic motivation due to their external simulation that cannot last forever [27]. From this point of view, it is necessary to explore other game elements and verify their effectiveness as well as their impact on intrinsic motivation.

Narrative in Educational Gamification

Hanus and Fox pointed out that more researched should be done investigating

the effectiveness of specific elements of gamification [28]. Kapp presented seven types of knowledge, along with the most matched game elements for each type and the one suits narrative is declarative knowledge, also known as verbal knowledge or factual knowledge that can only be learned through memorization [5]. From this, we can consider that applying narrative element to language learning can be a possible direction for educational gamification. Landers et al. presented a list of most promising gamified interventions which is based on Bedwell and colleague's game attribute taxonomy used for guiding future serious game research [29, 30]. One attribute related to narrative is game fiction, that is using a fictional game world or story. Narrative in the definition "delineates actions and events which causally unfold over time" [31] refers to demonstrating the series of events to the player while the game world depicts game context to the player through various ways. From this perspective, narrative can be seen as one type of gamification by facilitating instructional contexts to improve learning outcomes and motivation. For example, in the game "Call of Duty," players are asked to shoot and kill ten enemies (instructional content) when they act as heroes fighting for their

countries (narrative). Several studies illustrated narrative genre texts are conducive for providing on understanding, retention, recall, and ease of info-processing than other text genres [31-34]. These factors are also

A common narrative way in most stories is known as the Hero's Journey [36]. Hero's Journey sets real-life goals that are more appealing and, in turn, improves user's motivation [37]. There are 12-stages in hero's journey: Ordinary world where the Hero's exists before adventure begins; Call to adventure that hero starts his adventure when he receives a call to action; Refusal of the call shows the hero still needs to overcome fears before fully invested; Meeting the mentor means the hero meets a mentor figure who gives him something he needs at this crucial turning point; Crossing the threshold indicates the hero is ready for his adventure now; Tests, allies and enemies is a series of challenges for testing the hero; Approach to the inmost cave could represents many things such as a danger location or an inner conflict; Ordeal may be a dangerous physical test or a deep inner crisis that the hero must face; Reward means the hero ultimately becomes a better person and often with a prize; The road back means the hero must

fundamental in language learning. However, in the field of educational gamification, there are currently too few studies being conducted in the area of language learning [35].

return home with his prize now; Resurrection is the climax in which the hero must have his final and most dangerous encounter with death; Return with elixir is the final stage that the hero returns home after transforming into a new state[16]. Understanding the principle of this framework can help us convert ordinary learning into an interactive story [5]. The use of the Hero's Journey provides an easy, procedural way to turn any topic into a story that is likely to at least invoke some interests. It is a useful framework for providing a basic narrative structure while still leaving some space to shape the thematic environment. However, this limited freedom comes at the cost of being difficult to implement compared to PBLs.

Methodology

Experiment Objective

The purpose of this research is to investigate the effect of one single

gamification attribute (narrative/game fiction) applied to language learning. Based on what has been discussed above the following research questions guided this experiment:

Question 1: Does the use of narrative elements help improve the performance of language learning?

Hypothesis 1: The test scores among participants in the narrative group will be higher than those control group.

Question 2: Does the use of narrative elements help to enhance the interest/enjoyment of users?

Hypothesis 2: The questionnaire scores among participants in the narrative group will be higher than those control group.

This chapter describes the research methodology to answer the research questions.

Participants and Design

In this research, 48 participants (Male=19, Female=29) are examined via the methods of between-group design. The mean participant age was 24 years old ($SD = 3$). Participants are divided equally into two groups, one group as the

control group gets a basic instruction content while another one has a story as the instruction.

Three preliminary tests have been done to determine the difficulty of learning and test sections. Each participant needs to go through a learning section to learn 32 new words, and then they were asked to translate 15 English phrases and sentences in a test section. Afterward, they would fill in a questionnaire about satisfaction which derived from IMI. All steps were completed on a specially designed website (see Appendix B).

Training Materials

To guarantee that all 48 subjects learning the vocabulary knowledge remain in the same starting point, this research uses language Toki Pona [38], which is an artificial language that its elements are derived relatively from other common languages. Choosing such an exotic language is to ensure that most participants would not have any pre-existing knowledge because few people use Toki Pona or even know it. Besides, it is a language with minimal words. Toki Pona only contains 120 root-vocabulary; hence one root word may represent one

or more meanings, and other words need to be translated using a combination of two or more root words. For example, moku means eat, food and drink, mi means I, mine and me. 32 root words (see Appendix A) are selected for learning in this experiment. In the test section, all 32 words are tested in 15 sentences in a disordered order.

Experiment materials

A distinction from narrative in language learning needs to be defined. Using the Hero's Journey as one type of gamification is to create a fictional game world, and thus creates a meaningful experience rather than simply providing a language context for learning words. In this experiment, the fictional game world was created by instruction content.

In both groups, all the learning contents are the same, except for the instruction text. The control instruction content was first put forward and then altered its content to a narrative version with the same learning objectives were retained. The basic structure of the Hero's Journey was applied to the gamified content. Some stages in the Hero's Journey were merged into one stage or replaced by

default actions in this story to fit this experiment properly. Although more sentences were used in narrative content for fitting the story, the learning objectives kept the same in both groups. Appendix D demonstrates a sample of the control instruction content comparing the corresponding narrative instruction content.

Preliminary tests

Before running the formal experiment, three pre-tests were conducted to ensure an appropriate difficulty of training materials and translation task and the usability of the experiment website, as well as eliminate other unknown bugs that may cause a problem for users. Following details were modified based on three pre-tests.

1st pre-test. The participant was asked to do the learning section and test section and give feedback about the difficulty. After this test, the quantity of words was decreased from 36 to 32, the repetition times of each word was increased from 3 to 5-7; and the user interface was modified for disambiguation.

2nd pre-test. The participant was asked to do the whole experiment including learning, test and questionnaire section and give feedback about the usability of the website. After this test, two questions were changed in the questionnaire, more words were added to the instruction, and animation was added in each section to make the instruction more noticeable.

3rd pre-test. The participant was asked to go through the whole experiment process for double-checking. After this test, some words were slightly changed in the narrative instruction text, and questions were slightly changed in the training section.

After three pre-tests, the time spent in the entire experiment was controlled at about 20 minutes.

Measures

Correct rates. Two correct rates were recorded. One was the learning score that represents the correct rate of exercise in learning section which contains 56 single-choice questions in total. Another one was the test score. Each word worth 1 point in the test section and two function words were not taken into

account because of its occurrences. Therefore the total test score was 30.

Interest/Enjoyment. The Intrinsic Motivation Inventory (IMI) was used in this research. The validity of IMI has been verified by McAuley, Duncan, and Tammen [39]. Only a part of IMI which refers to interest/enjoyment was taken for this experiment. All questions amount to 8 were rated on a 7-point Likert scale, from 1 (not at all) to 7 (very true). The interest/enjoyment score was calculated by averaging across all of the items on this scale.

Procedure

When participants access the experiment website, they would be randomly assigned to either the control content version or the gamified content version.

Instruction. In the gamified content version, participants experienced the Hero's Journey by having a 5-steps dialogue with a Toki Pona mentor. In order to decrease the influence of control attributes (see Table 1), each step only had one choice for button-click.

Learning section. In the learning section, each participant was asked to memorize 32 Toki Pona words with their corresponding English meaning by learning word cards. 55 single-choice questions repeat those words to help with memorizing. The instruction content would show up four times to guide users during this training process.

Test section. After the learning section, each participant needed to translate 15 English phrases and sentences into Toki Pona. Each word showed only once in this section, except for two function words. This intended to aid in calculating the test scores after the experiment. The sequence of the test words was changed in order to eliminate a possible memory trajectory regarding a particular vocabulary order.

Questionnaire section. Participants were asked to fill in their gender and age. Lowrie et al. found that girls prefer mathematical video games that involve problem-solving, quantitative calculations, and graph curves whereas boys prefer games that involve visual-spatial capabilities [40]. Wohn found that players under the age of 32 play Facebook games to relieve boredom, while players were 32 and up play

Facebook games to help each other [41]. These studies suggest that genders and ages are necessary to be considered while designing gamification. After having their genders and ages a questionnaire for investigating their interest/enjoyment was filled in by each participant. Two extra questions aim at an intuitive experience of the narrative only presented in the narrative group. Questions included: “I thought the story was interesting” and “Having a storyline helped me while I’m learning.” Participants can leave an open comment in the end.

Table 1. Game element categories from the theory of gamified learning

Attribute	Theory	Definition
Action language	Presence Theory	The method and interface by which communication occurs between a player and the game itself
Assessment	The testing effect	The method by which accomplishment and game progress are tracked
Conflict/challenge	Goal-setting effect	The problems faced by players, including both the nature and difficulty of those problems
Control	Self-determination theory	The degree to which players are able to alter the game and the degree to which the game alters itself in response
Environment	Presence theory	The representation of the physical surroundings of the player
Game fiction	The Narrative Hypothesis	The fictional game world and story
Human interaction	Social constructivism	The degree to which players interact with other players in both space and time
Immersion	Presence theory	The affective and perceptual experience of a game
Rules/goals	Goal-setting theory	Clearly defined rules, goals and information on progress toward those goals, provided to the player

Resource: [29]

Results

Table 4 describes the descriptive variables for each variable and Table 5 shows a correlation matrix between variables. All the scores were kept two decimal places when processing. For some data that there is a significant result suggesting a deviation from normality, and Mann-Whitney U Test is applied.

Does narrative help improve the performance of language learning? A strong correlation ($p < .001$) between learning score and test score indicates that participants who put more effort into learning can achieve better results. Table 5 shows no significant difference between narrative group and control group. However, the narrative group's performance concluded higher scores in both the learning section ($M = 50.208$,

Table 5. Mann-Whitney U test.		
	W	p
Test score	228	0.219
Learning score	222	0.175
Interest/enjoyment score	310	0.657

SD=5.703) and test section (M=15.125, SD=7.225) than the control group's (M_{learning}=47.917, SD_{learning}=6.646; M_{test}=12.458, SD_{test}=7.102). These results offer no support to hypothesis 1

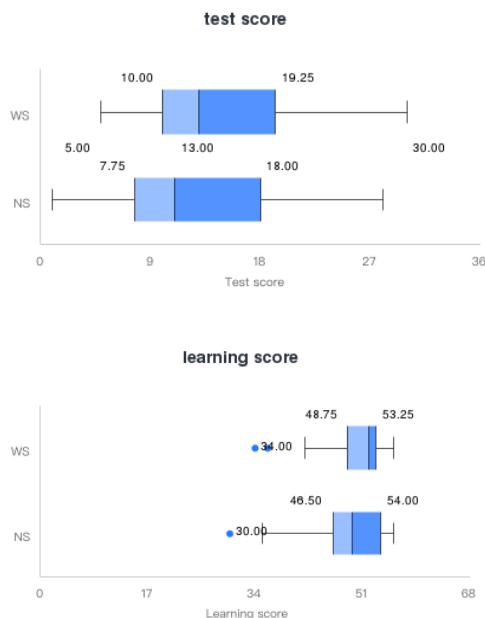


Figure 1. Learning and test performance of two groups (*NS=No Story*, *WS=With Story*)

Does narrative help enhance the interest/ enjoyment of users? From Table 4, we can also see that participants in control group scored their enjoyment (M=5.162, SD=1.522) slightly higher than the participants in the narrative

that the performance of narrative group will be better than control group.

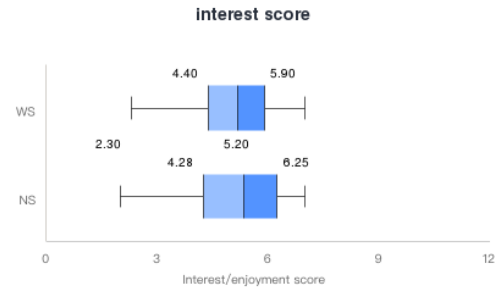


Figure 2. Interest/Enjoyment score of two groups

group (M=5.075, SD=1.135), but this difference was not statistically significant. Hence, hypothesis 2 is not supported.

Other findings. More statistics were conducted only for the narrative group. No significant difference was found between male (N=9) and female (N=15) or between two age groups (N=11 in 20-24 group and N= 13 in 25-32 group). In Figure 3 (see Appendix D), males (M=4.778, SD=0.833) showed more interest in this story than females (M=4.4, SD=1.639), although the females' test scores were higher. As for the age perspective (see Figure 4 in Appendix D), younger participants (M=5.564, SD=1.155) scored higher in their questionnaire than participants who were 25 and up (M=4.662, SD=0.975).

Table 4. Descriptive Statistics								
	Age		Learning score		Test score		Interest/enjoyment score	
	NS	WS	NS	WS	NS	WS	NS	WS
Mean	23.417	24.75	47.917	50.208	12.458	15.125	5.162	5.075
Median	23	25	49.5	52	11	13	5.35	5.2
Std. Deviation	2.977	2.817	6.646	5.703	7.102	7.225	1.522	1.135
Minimum	19	20	30	34	1	5	2	2.3
Maximum	30	32	56	56	28	30	7	7
Note. NS=No Story, WS=With Story								

Discussion

Holistically, the results suggest that the gamified language e-learning with narrative does not improve language learning outcomes and the motivation. This conclusion is consistent with Armstrong and Landers [42] who found no difference in declarative knowledge learning between the group with narrative and the control group in their study. Regarding the influence of demographic information, data from the narrative group has been discussed from both gender and age perspectives separately, but no significant differences are found as well. Five possible explanations are proposed for these natural findings of gamification in language learning.

First, although the results show no significant difference between the two groups, the mean scores of the narrative

group are still higher than the control group. Narrative may facilitate digital language learning as hypothesized, but this effect is not prominent in this research due to the small sample size, measure unreliability or the experiment tool. Some comments collected from participants indicate that Toki Pona may not be a proper training material for this experiment because its novelty led them so invested in the exercise and ignored the context. Hence, more kinds of languages and more participants are needed to run this experiment.

Second, Landers declared that both instructional content and game characteristics can affect learning outcomes independently [19]. In this research, we combined narrative with instructional content, but the basic structure and goal of instructional content kept the same in both conditions. From this point, we can argue that narrative as one type of gamification has little impact on language e-learning.

Third, negative comments from participants showed that the test was too difficult for them. This difficulty may decrease their motivation. As mentioned before, some positive comments indicated that the language was too exotic for them to fully concentrate on the exercise. Thus, the higher initial motivation was triggered by the excitement garnered by the new language rather than the narrative context. These polarized attitudes may have an influence on scores of interests/enjoyments. Thus, a pre-questionnaire about their baseline of attitudes towards language learning is necessary.

Fourth, statistics on demographic information gave possible considerations that attitudes toward gamified learning with narrative might be affected by participants' attitudes based on different types of stories in learning. Since the topic of this story revolves around an alien, males may convey more interest in the story when compared with females. Various types of stories may attract different people. Applying the Hero's Journey only provides a framework of a story, but the content in the Hero's Journey could influence participants' attitudes.

Fifth, younger people scored higher and put more effort into learning sections. This may indicate that gamified learning may better engage younger people. However, another explanation could be the personal traits of participants, like openness and curiosity, are of significant importance in gamified learning.

With the definition of gamification, the narrative attribute can be used generally but in different details to fit the right contents. The structure or content may be different based on the characteristics of the target group. In the process of designing the experiment, the most significant uncertainty of using narrative is the gap between the Hero's Journey and the complete final story. This gap was filled with the storyline, which was supplied only by the author. Although the storyline was developed further through pre-tests, it is still important to verify the validation of the story used in this experiment by professionals.

The key point of using narrative as gamification is to give users a sense of power - that their actions matter in a bigger picture. The feedback from questionnaires revealed that users gradually forgot the storyline when progressively performing exercises. This

defeated the sense of power that was initially provided by the introduction of the storyline and exemplified that this kind of sense was not addressed enough in this experiment. How to fully integrate the story with the training actions is a critical practice to achieve for using narrative as a type of gamification. This embodies the complexity of using narrative, since, when compared to PBLs, narrative is more difficult to generalize.

Limitations and Future Works

This research contains some limitations. An inevitable limitation of using a single gamification element research is the difficulty of isolating. Considering that games are a complex system that covers variously specialized knowledge such as psychology, physiology, and art, the research about the effectiveness of a single game element is hard to be distinct from other attributes.

This experiment was based on a specially designed language learning website and using a little-known language Toki Pona. However, participants reflected that their

interests in Toki Pona itself could have a significant impact on this experiment. More languages are needed to repeat this experiment. Besides, the test questions still need to be designed to fit an appropriate difficulty level. Asking language experts to validate the test questions would have improved the experiment.

While the Hero's Journey provides a universal framework for telling stories, the effectiveness of it for creating a meaningful and immersive game world needs to be verified. Also, the use of the Hero's Journey for language learning requires more investigation.

From the results, we can see the difference between the test scores and learning scores between the two groups is small. It could have been that more participants would reveal that there is a significant difference since the deviation from the mean is similar in size between both groups.

A pre-questionnaire about participants' attitudes toward gamified language learning and learning content needs to be included in order to overcome existing attitudes that could influence the user's results of this experiment. This could

identify users' level of motivation and may better clarify any specific increase or decrease in motivation as a result of their experience with gamified language learning. By providing a baseline with the pre-questionnaire, this could produce a more positive outcome of gamification in language learning, or it could support the distraction hypothesis that a story in training might increase a learner's cognitive load [10].

Language learning is a declarative knowledge and contains understanding, retention, recall, and ease of information processing. In this case, longitude research could be a future direction to examine whether narrative helps to improve the long-term memory.

Conclusion

This research investigated the effectiveness of applying a single game element, that is narrative as one type of gamification in language e-learning. Both learning outcomes and learning interests showed no significant difference among participants in the narrative group versus participants in the control group. Thus, this research does

not provide evidence for claims about value of narrative as gamification element in language e-learning. At least for the platform used in this research. We conclude that use of narrative as gamification element has less effect than we expected, or none at all.

According to current studies covering the effect of narrative on language learning, narrative positively affects learning outcomes combined with other game elements [43]. Different observations may occur if narrative is interactive with other elements. This research reflects a cautionary tale that the use of narrative as gamification is more complicated than claims in previous studies. More rigorous experimental research is needed to explore the effectiveness of gamification in language learning.

Finally, considering different kinds of personality traits, the attitudes towards different types of game elements are divergent. Application of gamification in language learning should not only be designed for learning goals but also needs to take character types into account.

To sum up, the use of narrative elements as a potential useful gamification tool should still be investigated. Although this

research did not produce any significant results, the average exercise scores are higher based on a narrative context. I postulate that improved measurements may enhance the accuracy of the results and that more effectively integrating narrative elements may lead to improved conclusions.

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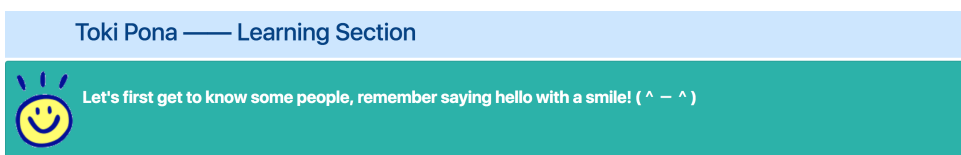
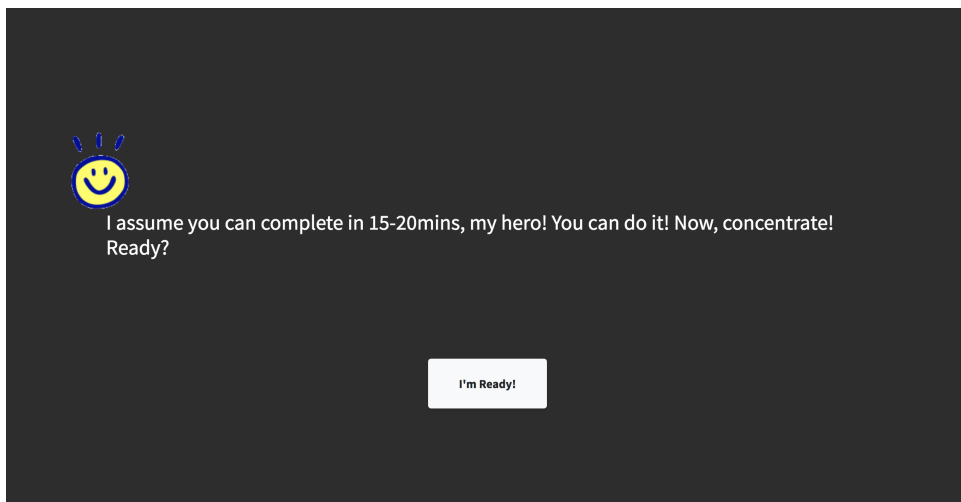
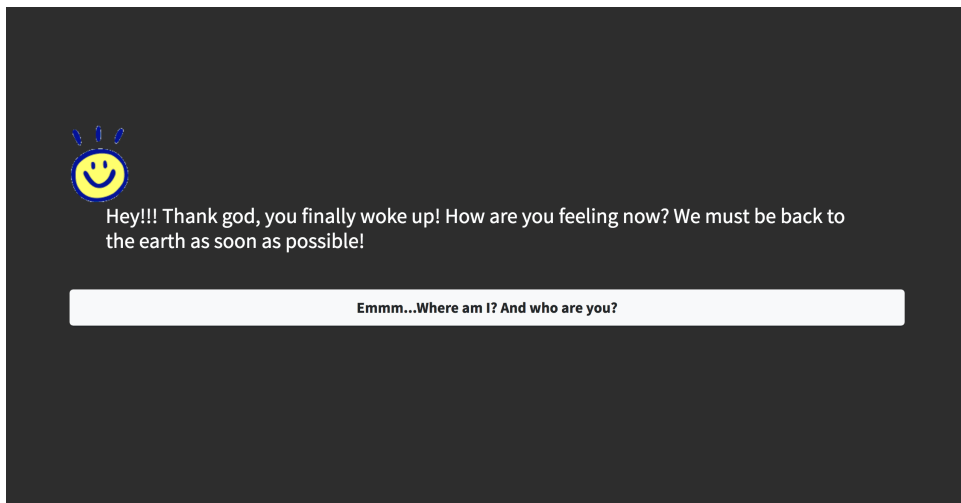
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Appendix

A. Training materials (32 Toki Pona words)

Toki	hello, language	Moku	food, eat, drink	Ala	zero	Jaki	dirty, nasty, trash
Pona	good, simple	Telo	water, liquid	Wan	one	Len	clothe, clothing
Mi	I, we, me, our	Li *	separates a 3rd person subject from its verb	Tu	two	Kule	color
Ona	he, she, it, they	Kili	fruit, vegetable	Luka	five	Jelo	yellow
Sina	you, your	Ni	this, that	Nanpa	number	Laso	blue
Nimi	name, word	Kala	fish, seafood	Lili	little	Loje	red
Meli	woman, wife, girlfriend, female	Lete	cold; to freeze	Mute	many	Pimeja	black
Mije	man, husband, boyfriend, male	Kasi	herb, plant	E *	separates the verb and the direct object	Walo	white

B. Website interface examples (WithStory)



toki

English meaning

hello; language

Next

Website interface examples (WithoutStory)

Toki Pona!

Welcome to this experiment! You will learn a new language named Toki Pona in this experiment. There will be 3 sections in total and may takes around 20-25mins.

In the 1st section you will learn 32 words in Toki Pona by word carts and single-choice questions.

In the 2nd section you are going to do a translation task contains 15 sentences.

At the end there will be a short questionnaire. Please fill it in as honestly as you can.

START NOW!

Toki Pona — Test Section

In this section, you're going to translate 15 sentences which includes all the words you've just learned. Try your best to recall them.

Hello!

Your translation

Next

C. Control instruction content and gamified instruction content

Control Instruction Content	Narrative Instruction Content	Corresponding stages
Start the experiment	Start the experiment*	Ordinary World
<p>Toki Pona!</p> <p>Welcome to this experiment! You will learn a new language named Toki Pona in this experiment. There will be 3 sections in total and may takes around 20-25mins.</p> <p>In the 1st section you will learn 32 words in Toki Pona by word carts and single-choice questions.</p>	<p>Hey!!! Thank god, you finally woke up! How are you feeling now? We must be back to the earth as soon as possible!</p> <p>(Emmm...Where am I? And who are you?)</p>	Call to Adventure
	<p>Don't you remember? We are on Toki Pona planet. You were sent here to steal a secret file. You got the file...but seems like you have lost your memory in this process. (what are you talking about? I don't remember... I just want to go home!)</p>	Refusal of the Call
	Toki Pona's logo*	Meeting the Mentor

<p>In the 2nd section you are going to do a translation task contains 15 sentences.</p> <p>At the end, there will be a short questionnaire. Please fill it in as honestly as you can.</p> <p>(Start now!)</p>	<p>Anyway, the only way to escape is pretending to be a local so we can deceive the gatekeeper.</p> <p>(Fine...What should I do?)</p> <p>If you can memorize the following 32 Toki Pona words, and pass the translation test given by that gatekeeper. Then we can go back to the earth!</p> <p>(Hummm...Sounds not too difficult.)</p> <p>I assume you can complete in 15-20mins, my hero! You can do it!</p> <p>Now, concentrate! Ready?</p> <p>(I'm ready!)</p>	<p>Crossing the Threshold</p>
<ul style="list-style-type: none"> - Part one: people - Part two: food - Part three: number - Part four: color 	<ul style="list-style-type: none"> - Let's first get to know some people, remember saying hello with a smile! (^ - ^) - Shall we stock something to eat? We need water and food. Do you want some sushi? - How many foods did we buy? one, two, three...(O_O)? Can you count again? - Don't forget to change the clothing! Otherwise we may be seized! Oh, look! So many colors! 	<p>Tests, Allies, Enemies</p>

Repetition of training words in learning section*	Repetition of training words in learning section*	Approach to the Inmost Cave
In this section, you're going to translate 15 sentences which includes all the words you've just learned. Try your best to recall them.	Time to face the gatekeeper! Talk to him in Toki Pona for the next 15 sentences to convince him. As long as we pass this, we can back to the Earth! I know you can make it !	Ordeal
Well done! Now please give some feedback about this learning experience. Thank you for your time!	Welcome home, my hero! We are waiting for you. Please accept my heartfelt thanks. :) Come here, you must have a lot of words to say now. Do you want to talk a bit?	Reward
End the experiment*	End the experiment*	The Road Back

(means this stage is replaced by default action.)*

D. Statistic tables and graphs

Table 2. Independent Samples T-Test (genders)

	t	df	p
Learning score	0.281	22.000	0.782
Test score	0.878	22.000	0.389
Interest/enjoyment score	-0.045	22.000	0.964
I thought the story was very interesting	-0.640	22.000	0.529
Having a storyline helped me while I'm learning	-0.155	22.000	0.878

Note. Female=15, Male=9, N=24

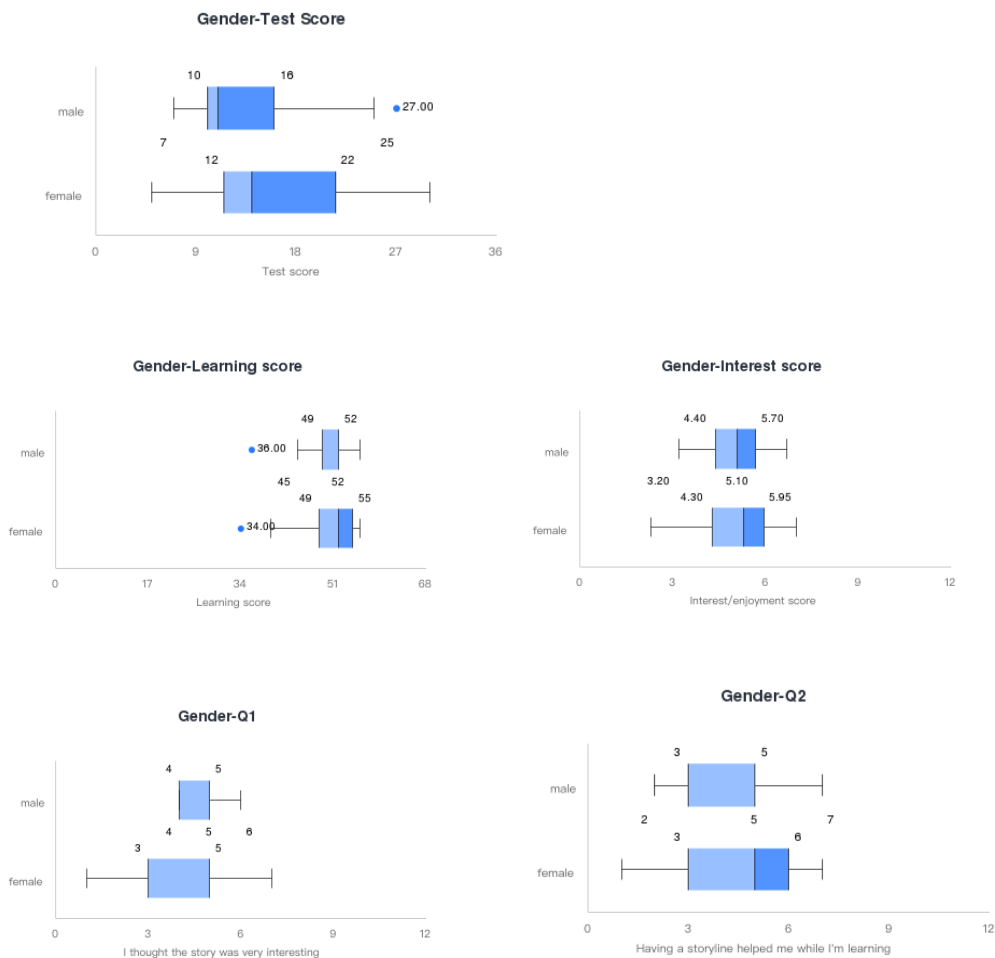
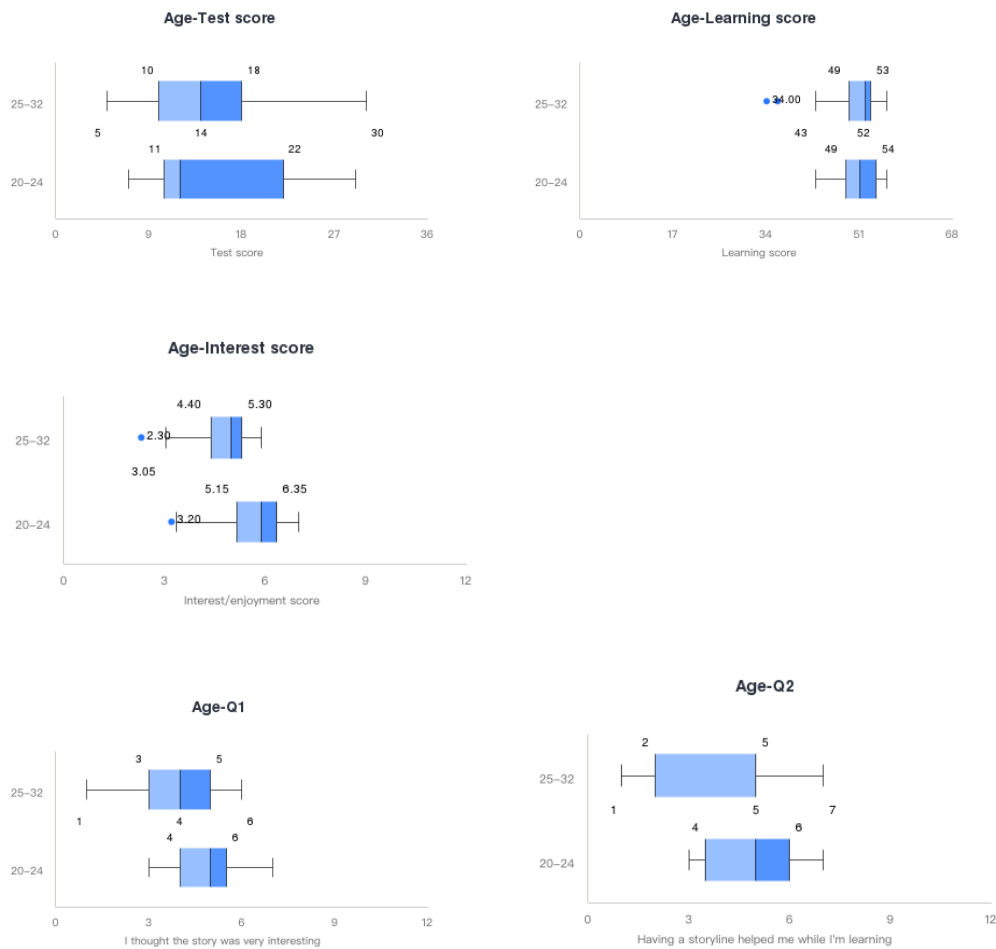


Figure 3. Descriptive plots of gender

Table 3. Independent Samples T-Test (Ages)

	t	df	p
Learning score	0.617	22.000	0.543
Test score	0.369	22.000	0.716
Interest/enjoyment score	2.076	22.000	0.050
I thought the story was very interesting	1.538	22.000	0.138
Having a storyline helped me while I'm learning	1.213	22.000	0.238

Note. 20-24 group=11, 25-32 group=13, N=24

**Figure 4.** Descriptive plots of age groups