Thursday, August 17th, 2023 (16:00~16:20), University of Iceland
Veröld Building – House of Vigdís, Room 108

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The Effects of Gamified Daily Awards on Digital Vocabulary Flashcard Learning

Support received from the Japan Society for the Promotion of Science
KAKENHI Grant-in-Aid for Scientific Research ©,Grant Number 19K00899
https://kaken.nii.ac.jp/en/grant/KAKENHI-PROJECT-19K00899/

The concept of "game-informed application(s)" or "gamification" is

the inclusion of game-design elements and principles

(e.g., earning points, storylines, game-based thinking)

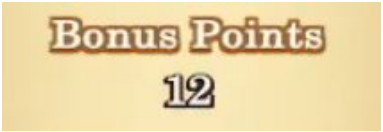
in other fields/areas (e.g., shopping, work, education)

to encourage and retain engagement.

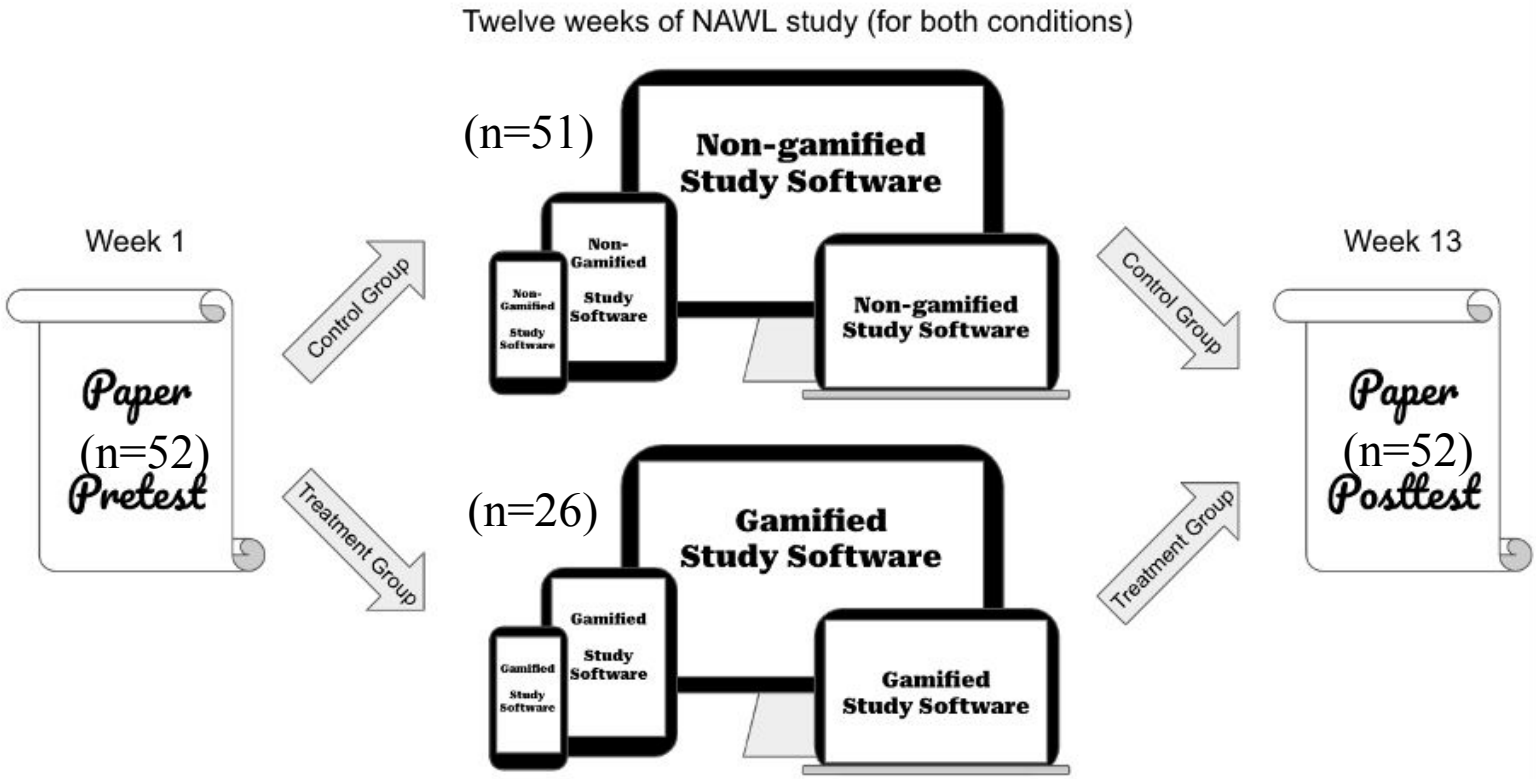
(presenter's personal definition)

	Structural Gamification	Content Gamification
	 E.g, Magoosh Vocabulary Flashcards Rizwan & Danesh (2021)	 E.g., Xeropan English Learning App Thékes & Szilvássy (2021)
Definitions	"Structural gamification is the application of game-elements to propel a learner through content with no alteration or changes to the content" (Kapp et al., 2013)	"Content gamification is the application of game elements, game mechanics and game thinking to alter content to make it more game-like" (Kapp et al., 2013)

Participation-linked gamified daily awards were included the author's digital vocabulary Flashcard Learning software



Comparative study of two groups



Repeated Pre / Posttest audio driven paper-test

k = 57 (19 selected NAWL words x 3 question types)

Table 4. Pre/Posttest Sections and Task Flow

Test sections	Task flow	Similar Test Format
(1) "Meaning" Listening Recall	After listening to a sentence and target word audio in English, the participant was asked to translate the target word in Japanese.	(McLean et al., 2021) Spoken Receptive Meaning-Recall /Listening meaning-recall
(2) "Form" Dictation Recall	After listening to the target word audio in English, the participant was asked to write its basic/dictionary form in English.	(Cheng & Matthews, 2018) Testing productive / phonological (ProPhon) vocabulary knowledge
(3) "Use" Listening Recall	After listening to the sentence audio in English of the target word, the participant was asked to write its translation in Japanese.	None, but inspired by Nation's (2001) suggestion to enable a more "in-depth" learning/testing of vocabulary to assure the correct "use" of the words.


Listen
Play

Both groups had an identical semester goal and recommended weekly study pace

Semester goal: 2400 = Total cards studied (points)

By the end of week 1 - aim for 200 cards studied or more
By the end of week 2 - aim for 400 cards studied or more
By the end of week 3 - aim for 600 cards studied or more
By the end of week 4 - aim for 800 cards studied or more
By the end of week 5 - aim for 1000 cards studied or more
By the end of week 6 - aim for 1200 cards studied or more
By the end of week 7 - aim for 1400 cards studied or more
By the end of week 8 - aim for 1600 cards studied or more
By the end of week 9 - aim for 1800 cards studied or more
By the end of week 10 - aim for 2000 cards studied or more
By the end of week 11 - aim for 2200 cards studied or more
By the end of week 12 - aim for 2400 cards studied or more

Research Questions

RQ1. Do gamified daily awards have an effect on vocabulary software satisfaction?

RQ2. Do gamified daily awards have an effect on digital flashcard study habits?

RQ3. Do gamified daily awards have an effect on vocabulary learning outcomes?

RQ1. Do gamified daily awards have an effect on vocabulary software satisfaction?

Inconclusive, not statistically significant p = .280

Table 36. Prior and Treatment-Used Software Satisfaction (Within Groups)

Group#	Prior Soft Satisfaction Mean (SD) [CI]	Study Soft Satisfaction Mean (SD) [CI]	Mann-Whitney *p* value	Effect size *z*-derived *r*
(0) *n*=23	3.43 (0.95) [3.03, 3.84]	3.39 (0.92) [2.90, 3.88]	*U* = 258.000 *p* = .884	*r* = -.022
(1) *n*=10	3.40 (0.97) [2.71, 4.09]	3.80 (0.59) [3.22, 4.38]	*U* = 65.000 *p* = .280	*r* = .261▪

Note. (0) Non-gamified Group, (1) Gamified Group
(responses) 5-point Likert scale responses: 1= very low satisfaction ~5= very high satisfaction
(Effect size *z*-derived *r*) ▪ = .100 ~ .300 Small effect size

RQ2. Do gamified daily awards have an effect on digital flashcard study habits?

Yes, they encouraged a more steady approach to learning.

Significance/Effect :

No effect

Low/little effect

Substantial effect

Table 37. Gamification Level Comparison and Software Participation Results

Data point	Group#	Median (IQR)	[Min, Max]	Mann-Whitney test	Effect size *z*-derived *r*
# of tasks completed	(0) *n*=51 (1) *n*=26	2313.00 (569) 2228.50 (745)	[1043, 2613] [1141, 2723]	*U* = 614.500 *p* = .601	*r* = -.060
# of active study days	(0) *n*=51 (1) *n*=26	20.00 (13) 24.50 (36)	[4, 52] [9, 77]	*U* = 809.500 *p* = .114	*r* = .180▪
# of tasks per active study day	(0) *n*=51 (1) *n*=26	104.76 (73.14) 82.11 (87.39)	[45.27, 280.75] [33.42, 242.67]	*U* = 448.000 *p* = .021**	*r* = -.264▪
# of total task study minutes	(0) *n*=51 (1) *n*=26	580.00 (229) 591.00 (205)	[240, 1214] [258, 1344]	*U* = 672.500 *p* = .918	*r* = .012
# of tasks completed per minute	(0) *n*=51 (1) *n*=26	3.71 (1.48) 3.58 (1.10)	[1.98, 5.63] [1.79, 5.14]	*U* = 605.500 *p* = .536	*r* = -.071
# of 10+ minute study days	(0) *n*=51 (1) *n*=26	12.00 (8) 11.00 (8)	[11.44, 14.60] [9.50, 15.20]	*U* = 586.500 *p* = .409	*r* = -.094
# days where all awaiting review tasks were completed	(0) *n*=51 (1) *n*=26	9.00 (7.00) 9.00. (9.00)	[2.00, 20.00] [4.00, 34.00]	*U* = 766.000 *p* = .266	*r* = .127▪

Note. (0) Non-gamified Group, (1) Gamified Group
(Statistical evidence* p value) ** = ($0.01 \leq P < 0.05$) Moderate evidence
(Effect size▪ *z*-derived *r*) ▪ = .100 ~ .300 Small effect size

RQ3. Do gamified daily awards have an effect on vocabulary learning outcomes?

~Yes, p-value = .030 perhaps due to the fact they were informed by the spaced learning principle

Total Word gain estimation by group:

Non-gamified ~57 words

Gamified ~102 words

Table 39. Gamification Level Comparison and Pre/Posttest Score Results

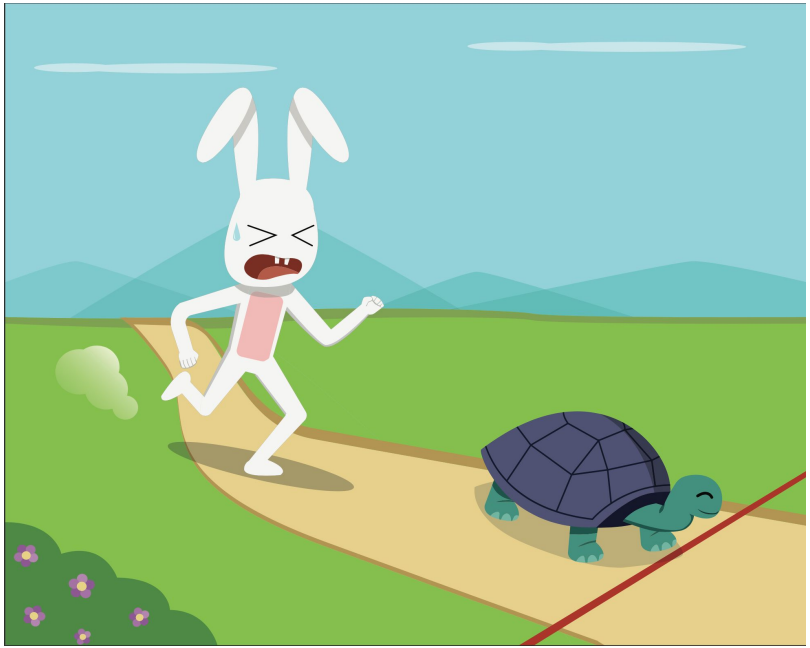
Group #	Test	Meaning score /19 [%] Median (IQR)	Form score /19 [%] Median (IQR)	Use score /19 [%] Median (IQR)	Total score /57 [%] Median (IQR)
Group (0) *n*= 37	Pre	[15.8%] 3.00 (4)	[10.5%] 2.00 (2)	[5.3%] 1.00 (2)	[10.5%] 6.00 (8)
	Post	[31.6%] 6.00 (4)	[26.3%] 5.00 (4)	[13.2%] 2.50 (3)	[22.8%] 13.00 (8)
	Diff.	[+15.8%] +3.00 (+0)	[+15.8%] +3.00 (+2)	[+7.9%] +1.50 (+1)	[+12.3%] +7.00 (+0)
Group (1) *n*= 15	Pre	[31.6%] 6.00 (4)	[31.6%] 6.00 (6)	[21.1%] 4.00 (4)	[29.8%] 17.00 (10)
	Post	[55.3%] 10.50 (3)	[52.6%] 10.00 (4)	[42.1%] 8.00 (4)	[51.8%] 29.50 (9)
	Diff.	[+23.7%] +4.50 (-1)	[+21%] +4.00 (-2)	[+21%] +4.00 (+0)	[+22%] +12.50 (-1)
Mann-Whitney		*U* = 376.500	*U* = 328.500	*U* = 416.500	*U* = 384.500
p value		*p* = .045**	*p* = .299	*p* = .005***	*p* = .030**
z-derived *r*		*r* = .278▪	*r* = .144▪	*r* = .393▪▪	*r* = .300▪

Note. (0) Non-gamified Group, (1) Gamified Group [%] = Median%, Diff.= score difference
(Statistical evidence p value) ** = ($0.01 \leq P < 0.05$) Moderate evidence; *** = ($0.001 \leq P < 0.01$) Strong evidence
(Effect size *z*-derived *r*) ▪ = .100 ~ .300 Small effect size; ▪▪ = .300 ~ .500 Medium effect size

“For a game to be truly successful, development should be informed by theory and practice.”
(Reinhardt, 2019)

In conclusion, the observed positive learning outcomes in regard to this study were in all probability due to the fact that the gamified elements were strongly informed by the principle of spaced learning (that encourages numerous but shorter intervals of spaced study, and is more conducive to a higher efficiency of learning; Kang, Lindsey, Mozer, & Pashler, 2014; Nakata, 2015; Pyc & Rawson, 2007).

Many authors have alluded that the promise of gamification in education is related to its aim in increasing learners' overall learning time and engagement.



However,

perhaps gamification's true promise in education lies more in encouraging a higher quality/efficiency of study than a higher quantity of study.

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Also a special thanks to:

My friends at MAGE Montreal (javascript programming)

My former teachers at Okayama University

JALT Vocabulary SIG

Also, Yu Kanazawa, Tatsuya Nakata, Jeff Stewart, Raymond Stubbe, Stuart McLean, Charles Browne, Phil Bennett, Tim Stoeckel and JALT Vocab Sig committee members

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