

Supplementary Materials S1

Questionnaire

Performance expectancy (based on Venkatesh et al., 2003)

1. Learning English vocabulary through gamified English vocabulary apps increases my learning efficiency.
2. Gamified English vocabulary apps enable me to remember new English vocabulary more quickly.
3. I find gamified English vocabulary apps more useful than other methods in my English vocabulary learning.

Effort expectancy (revised from Chang & Hsu, 2012)

1. I think it could be easy for me to find gamified English vocabulary apps.
2. It is easy for me to learn English vocabulary through gamified English vocabulary apps.
3. I think it is easy to use gamified English vocabulary apps.

Social influence (revised from Kallaya et al., 2009; Venkatesh et al., 2003)

1. I am influenced by my classmates to learn English vocabulary through gamified English vocabulary apps.
2. I think that students are positive about using gamified English vocabulary apps.
3. I think that university teachers are supportive of the usage of gamified English vocabulary apps.

Facilitating conditions (based on Venkatesh et al., 2003)

1. I have the resources necessary to gamified English vocabulary apps.
2. I could find gamified English vocabulary apps.
3. I can find support if I experience problems with gamified English vocabulary apps.

Behavioral intention (revised from Kallaya et al., 2009)

1. I intend to use gamified English vocabulary apps to learn English vocabulary in the near future.
2. I predict I will use gamified English vocabulary apps to learn English vocabulary more often in the near future.
3. I intend to advise others to learn English vocabulary through gamified English vocabulary apps in the near future.

Positive competitiveness (revised from Xie et al., 2006)

1. I like competition because it gives me an opportunity to see my potential.
2. I like the challenges brought by competing with others.
3. I like competition because it helps me to bring out the best in me rather than making me feel good about surpassing other people.

Openness (self-designed)

1. I am interested in abstract ideas.
2. I am willing to accept new things.
3. I am interested in many things.

Perseverance of effort (revised from Alamer, 2021)

1. I work hard towards my English vocabulary learning goals irrespective of how long they take to achieve.
2. I complete my English vocabulary learning tasks irrespective of how difficult they are.
3. Once I set a vocabulary learning goal, I will try to overcome any challenge that arises.

Emotional stability (Self-designed based on Cattell & Mead, 2008)

1. I seldom have ups and downs.
 2. Small things cannot bother me when I am working or studying.
 3. I do not lose my temper easily.
 4. Unimportant things do not make me worried.
 5. I do not soon feel down when I encounter difficulties.
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Attitudes towards behavior (revised from Thomas et al., 2013)

1. Using gamified English vocabulary apps to learn English vocabulary is a good idea.
2. I would like to use gamified English vocabulary apps to learn English vocabulary.
3. I think it is fun to learn English vocabulary through gamified English vocabulary apps.

Actual use (revised from Kim et al., 2007)

1. On average, I often use gamified English vocabulary apps.
 2. On average, I spend some time using gamified English vocabulary apps every week.
 3. On average, I can concentrate on use of gamified English vocabulary apps.
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Note. Five-point Likert Scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

Supplementary Materials S2**Assessment of normality**

Variable	min	max	skew	c.r.	kurtosis	c.r.
ES5	1.000	5.000	-0.389	-5.192	-0.533	-3.556
ES4	1.000	5.000	-0.325	-4.334	-0.686	-4.580
O1	1.000	5.000	-0.223	-2.972	-0.675	-4.506
O2	1.000	5.000	-0.792	-10.573	1.297	8.657
O3	1.000	5.000	-0.764	-10.208	1.126	7.520
POE1	1.000	5.000	-0.624	-8.337	0.388	2.590
POE2	1.000	5.000	-0.451	-6.028	-0.082	-0.547
POE3	1.000	5.000	-0.572	-7.639	0.128	0.858
ES1	1.000	5.000	-0.041	-0.545	-0.847	-5.656
ES2	1.000	5.000	0.074	0.991	-0.851	-5.684
ES3	1.000	5.000	-0.379	-5.068	-0.618	-4.126
PC1	1.000	5.000	-0.573	-7.657	-0.220	-1.470
PC2	1.000	5.000	-0.440	-5.881	-0.535	-3.570
PC3	1.000	5.000	-0.365	-4.873	-0.587	-3.920
ATB3	1.000	5.000	-0.872	-11.640	0.974	6.503
ATB2	1.000	5.000	-0.869	-11.607	0.673	4.493
ATB1	1.000	5.000	-0.796	-10.631	0.823	5.495
BI3	1.000	5.000	-0.379	-5.060	-0.215	-1.435
BI2	1.000	5.000	-0.440	-5.882	-0.313	-2.091

Variable	min	max	skew	c.r.	kurtosis	c.r.
BI1	1.000	5.000	-0.443	-5.914	-0.312	-2.083
U3	1.000	5.000	-0.370	-4.937	-0.617	-4.123
U2	1.000	5.000	-0.179	-2.395	-0.969	-6.472
U1	1.000	5.000	-0.142	-1.892	-0.940	-6.275
FC1	1.000	5.000	-0.476	-6.361	-0.357	-2.383
FC2	1.000	5.000	-0.934	-12.479	1.273	8.501
FC3	1.000	5.000	-0.457	-6.099	0.132	0.879
SI2	1.000	5.000	-0.454	-6.068	0.555	3.705
SI3	1.000	5.000	0.055	0.732	0.309	2.060
PE1	1.000	5.000	-0.678	-9.057	0.693	4.626
PE2	1.000	5.000	-0.553	-7.384	0.435	2.907
PE3	1.000	5.000	-0.064	-0.850	-0.142	-0.948
EE1	1.000	5.000	-0.577	-7.709	-0.113	-0.755
EE2	1.000	5.000	-0.542	-7.240	0.193	1.289
EE3	1.000	5.000	-0.725	-9.688	0.877	5.857
Multivariate					388.056	128.278