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University Students' Engagement with Feedback in a Quiz Platform: A Case Study of Quizizz

Mai Thi Truc Le, and Khue Van Tran

FPT University, Can Tho Campus, Vietnam

Abstract

Students' engagement with feedback is vital for the learning process. It is widely acknowledged that technology can enhance students' engagement with feedback, however, research on technology generated feedback tools emphasise that different technologies have varying impacts on students' engagement. There is a gap in the research shedding light on students' engagement with feedback from quiz platforms. This mixed-methods study aims to examine the extent to which and how students engage with feedback on the Quizizz platform, drawing from Fredrick et al.'s (2004) framework of student engagement, including affective engagement, behavioural engagement, and cognitive engagement. Data was collected from a questionnaire with 294 respondents who were learning English as a foreign language at a private university in Vietnam and 3 focus group interviews with 15 participants. The findings indicate that participants moderately engaged with feedback from the quiz platform, and these engagements were quite complex. Moreover, data from the interviews revealed aspects of the quiz platform that can enhance students' engagement with feedback. Additionally, an Exploration Factor Analysis was conducted to explore the structure of the questionnaire measuring students' engagement with feedback, which confirms the usefulness of the framework in measuring students' engagement with feedback from an interactive platform. The implications for using a quiz platform regarding students' feedback literacy were discussed.

Citation

Introduction

34 A quiz consisting of a set of closed question is a popular method of measuring low cognitive skills
35 (McLaughlin & Yan, 2017) or factual knowledge (Enders et al., 2021). Quizzes followed with
36 feedback can have positive impacts for students' retention (Rüth et al., 2021), academic
37 achievement (Förster et al., 2018), learning outcomes and learning satisfaction (Hennig et al.,
38 2019). The benefits can be explained by several theories. First, the re-exposure, as reported by
39 Palumbo et al. (2021), can create opportunities to recall learned information through repetition.
40 Quizzes administered after learning can provide students with additional exposure, enabling them
41 to benefit from mere exposure effect. Second, the retrieval effort theory, Pyc and Rawson (2009),
42 emphasises that retrieval practice can enhance better memory and the harder but successful the
43 retrieval, the better the memory. While taking a quiz, students employ their cognitive effort to
44 activate the target information from the memory, leading to activating the effect of retrieve effort.
45 McLaughlin and Yan (2017) further explain that feedback from a quiz can inform students what
46 they know and what they need to reinforce, which might encourage students to search for and
47 review the gap knowledge. Actively searching for knowledge leads to better memory than
48 passively rereading it (Roediger III et al., 2011). Finally, in the educational technology area,
49 gamified quiz is considered to strengthen the effect of testing (Sanchez et al., 2020). Also, the
50 benefits of a gamified quiz are further supported by Landers's (2014) gamification theory.
51 According to Landers, game characteristics can affect students learning behaviours and attitudes,
52 which either directly influence on learning or strengthen the relationship between instruction and
53 learning outcomes. In this respect, it is possible for feedback as a game attribute to have impact
54 on students' behaviour which have positive impacts on learning outcomes.

55 It is vital for students to actively engage with feedback because their engagement is even more
56 important than the quantity of feedback provided (Hattie & Clarke, 2018). Students' feedback
57 literacy is one of the crucial factors influencing their engagement with feedback. This term is
58 defined as "students' understanding of what feedback is and how it can be managed effectively;
59 capacities and dispositions to make effective use of feedback; and appreciation of the roles of
60 teachers and themselves in these processes" (Carless and Boud, 2018, p. 1316). In this regard,
61 to actively engage with feedback, students must understand feedback received, employ effective
62 strategies to deal with it and recognise the responsibilities of both their teachers and themselves.

63 While implementation of technology in education is one of the ways to enhance engagement with
64 feedback, it is possible that technology is not always beneficial to students' feedback process
65 (Winstone & Carless, 2019). Some scholars have reached a consensus on the positive role of
66 technological tools in fostering feedback engagement (e.g., AbuSa'aleek & Alotaibi, 2022;
67 Cavaleri et al., 2019). However, not all technologies have the same impact on engaging students
68 with feedback. Some technologies just simply transfer feedback to students in a similar way as
69 that of traditional feedback practice (Winstone & Carless, 2019). Recent studies by Deeley (2018)
70 and Winstone et al. (2021) have argued that technological tools can offer both benefits that
71 enhance students' engagement with feedback and drawbacks that may discourage them from
72 such engagement. Additionally, technology-enhanced feedback via email might be avoided by
73 some students because email may be too formal (Lewis et al., 2024). Giving the ongoing debate

74 regarding the roles of technology in feedback engagement, it is important to explore students'
75 engagement with feedback in a gamified quiz tool.

76 We conducted our research on Quizizz because of several reasons. This is a gamified quiz
77 application for formative assessment, allowing students to have not only corrective feedback,
78 which is common in other quiz tools, but also explanation feedback. Providing further explanation
79 for the answers might be hard to find in other quiz platforms. Most importantly, this platform has
80 been widely accepted by teachers worldwide through usefulness, ease of use, practicability and
81 ability to motivate students. These positive attributes are highlighted through the finding reported
82 by a systematic review of 45 articles from the year 2017 to 2021 by Lim and Yunus (2021).

83 This study draws on Fredricks et al.'s (2004) engagement framework, which includes affective,
84 behavioural, and cognitive dimensions, to gain insights into students' engagement with feedback
85 on Quizizz. This framework is appropriate for our study because it is widely adopted in research
86 on student engagement in the field of education (e.g., Koltovskaia, 2020; Man et al., 2021;
87 Virtanen et al., 2018; Wang & Fredricks, 2014; Yu et al., 2019; Zhang & Hyland, 2022) and is
88 considered the most preferable framework for engagement in educational studies as observed by
89 Martins et al. (2022) after conducting a systematic review of related research articles up to 2018.
90 Additionally, among the two extensively employed frameworks for studying engagement in
91 educational contexts, namely Fredricks et al.'s (2004) framework and Schaufeli et al.'s (2002)
92 model, Fredricks et al.'s is particularly noted for its greater focus on the behavioural aspect
93 compared to Schaufeli et al.'s (2002) model, which includes absorption, vigour, and dedication
94 factors. Therefore, Fredricks et al.'s framework aligns more closely with the purpose of our study,
95 which is to examine students' engagement behaviours. Given that engagement with feedback is
96 fundamentally a form of behaviour, we employ the framework in search for the answers for the
97 following questions.

98 1. To what extent do university students engage with feedback on the Quizizz platform?

99 2. How do university students engage with feedback on the Quizizz platform?

100 Our findings provide insight into the extent and nature of university students' engagement with
101 feedback on Quizizz, a gamified quiz platform. This understanding is significant for supporting the
102 deployment of Quizizz or similar quiz technologies in enhancing students' engagement with
103 feedback, which has been known to be positive for tertiary students in learning factual or semantic
104 knowledge. Furthermore, this study contributes to supporting the roles of immediate feedback
105 from a quiz platform in a student centred-learning environment. Specifically, our findings inform
106 the student's preference of feedback types, such as corrective feedback and explanation
107 feedback, in quiz assessments. This understanding can offer recommendations for educators and
108 administrators to design and implement quizzes and feedback on Quizizz and similar platforms
109 to enrich learning and teaching.

110 **Literature Review**

111 **The Framework of Students' Engagement with Feedback**

112 Engagement with feedback is defined as students' response to feedback they receive and can be
113 examined in three dimensions, including cognitive, behavioural, and affective aspects (Ellis,
114 2010). According to Fredricks et al. (2004), the constructs of behaviour, cognition, and affection

115 can collectively offer a holistic comprehension of the notion of engagement. Affective engagement
116 consists of both positive and negative reactions to learning, such as happiness or sadness;
117 interest or boredom, and usefulness or uselessness (Fredricks et al., 2004). Behavioural
118 engagement refers students' active participation in learning tasks, involving their effort,
119 persistence, concentration, attention, questioning, and contribution to class discussions within the
120 learning process (Fredricks et al., 2004). In this sense, such engagement is observable (Nguyen
121 et al., 2018). Cognitive engagement includes students' careful thinking and eagerness to make
122 necessary efforts to gain insights into the target knowledge and enhance their skills (Fredricks et
123 al., 2004). In other words, this represents the internal effort made by students in the learning
124 process to understand, master knowledge or skills (Nguyen et al., 2018). Moreover, cognitive
125 engagement is also the use of both deep and surface levels of self-regulation strategies to
126 promote understanding (Fredricks et al., 2004). The former includes metacognitive and effort
127 management strategies such as "regulating attention, persistence, relating new information to
128 existing knowledge, and actively monitoring comprehension" while the latter consists of "help-
129 seeking or effort-avoidant strategies that maximize short-term retention of information" (Fredricks
130 et al., 2004, p.68).

131 Our study adopts the framework proposed by Fredricks et al. (2004) because of several reasons.
132 First, it is widely acknowledged as a popular engagement framework in the field of education (e.g.,
133 Virtanen et al., 2018; Wang & Fredricks, 2014). A thorough review of 102 articles up to 2018
134 conducted by Martins et al. (2022), following the PRISMA statement and Cochrane's guidelines
135 found a prevalent preference for engagement framework proposed by Fredricks et al. (2004) in
136 the original works investigated. Later, this framework has been consistently employed to gain
137 insights into students' engagement with feedback in various educational studies (Koltovskaia,
138 2020; Man et al., 2021; Yu et al., 2019; Zhang & Hyland, 2018, 2022). Besides, in a comparison
139 between Fredricks et al.'s (2004) model and another three-dimensional model, namely Schaufeli
140 et al.'s (2002) model which includes absorption, vigour, and dedication factors, Alrashidi et al.
141 (2016) indicated that Fredricks et al.'s (2004) framework is more behaviour-focused while
142 Schaufeli et al.'s (2002) model emphasizes mental and emotional aspects.

143 As engagement with feedback is a type of behaviour, we contend that Fredricks et al.'s (2004)
144 framework is uniquely suited for providing a holistic understanding of students' engagement with
145 feedback.

146 **Related Studies on Technology Enabled Feedback Engagement**

147 Several researchers have also been interested in how students engage with feedback delivered
148 through technological tools.

149 Deeley (2018) conducted the study on three focus groups and five semi-structured individual in-
150 depth interviews with 20 undergraduate students at a Scottish university. The researcher
151 compared three technologies, namely Mahara, Echo360 System/ Google Glass and Camtasia for
152 three types of feedback, namely written feedback for journals, co-assessment for students' oral
153 presentation and audio-visual screen casting respectively to understand how these tools benefit
154 students learning from feedback. Of the tools, feedback from the audio-visual screen casting was
155 the most interesting and paid more attention and consideration since the feedback is described
156 as straightforward, individualised, and beneficial. The study also identified limitations in other

157 tools, such as difficulty of use and incompatibility with students' devices, which prevents some
158 students from actively engagement with the feedback.

159 The benefit of audio-visual feedback has been confirmed in a current study by Cavaleri et al.
160 (2019). They employed mixed method study to compare the effectiveness of the audio-visual
161 feedback and the written feedback modes for students' writing. The data of 80 papers from 20
162 students and semi structure interview with three students in an Australia higher education
163 institution indicated that the audio-visual feedback is more effective in engaging students with
164 feedback thank to its "multimodal format, conversational tone, verbal explanations and
165 personalised feel" (p.1).

166 Winstone et al. (2021) who conducted experimental research on students' engagement with
167 feedback in a learning management system found that the implementation of technology in
168 education has added both barriers and positive impacts on students' engagement with feedback.
169 Analysing 33 UK university students' self-reported data, the study revealed that the separation of
170 grades and feedback led to varied interactions with feedback. Noticeably, some participants
171 focused solely on grades and others had only surface engagement with comments like thinking
172 about the feedback or taking notes. For these participants' perspectives, technology played a
173 crucial role in enabling them to engage with feedback by providing tools that guide them in
174 correcting their problems, synthesizing the feedback and noting their further actions.

175 In a similar vein, AbuSa'aleek and Alotaibi (2022) presented evidence of students' positive
176 engagement with tutor online feedback during the Covid era. Analysing data from 40 tutors with
177 various background across four English Departments using the Blackboard learning management
178 system, the study showed that students tend to seek for clarification if feedback (audio-feedback,
179 screencasts e-feedback, written e-feedback) was unclear. Additionally, students understood the
180 feedback, and actively participated in discussions about the received feedback. However, the
181 study acknowledged limitations in generalizability due to a small sample size of tutors.

182 Most recently, Lewis et al. (2024) compared students' accepting feedback by emails between pre
183 pandemic course 2019 (n=192) and a similar post pandemic 2022 (n=118) in an Australia
184 University. The data revealed that those students at post Covid 19 were less engaged with
185 feedback than those pre Covid cohort. One possible explanation for such finding may be the
186 declining preference for emails use among Gen Z and Millennial students (Lewis et al., 2021).

187 These empirical studies revealed that the technological tools offer both benefits and drawbacks
188 for students' feedback engagement, creating either barriers or enhancements. Consequently, the
189 extent of students' engagement with feedback can vary across different tools. Hence, it is
190 necessary to conduct further research to explore how students' engagement with feedback on a
191 quiz game platform. Additionally, there is scant research on technology- enhanced feedback
192 employing the framework of engagement with feedback, comprising cognitive, behavioural,
193 affective dimensions proposed by Fredricks et al. (2004).

194 **Materials and Methods**

195 **Materials**

196 Quizizz is a quiz game platform created by two Indian teachers, namely Ankit and Deepak. As a
197 gamification platform, this game includes popular educational features such as points, levels,

198 progress bars, badges and feedback, which can enhance students' engagement with learning
199 (Burlacu et al., 2023; Nah et al., 2014). This quiz tool provides its users with various forms of
200 questions, including Multiple choice, Fill-in-the-blank, Reorder, Match, Drag and drop, Drop down,
201 Match response, Lebling, Hot spot, Graphing, and Categorize, Draw, Open ended, video
202 response and Audio response as seen in Figure 1. However, our quizzes focused mainly on
203 Multiple choice and Fill- in-the-blank test items because these types are available in the free
204 version of Quizizz. More importantly, with Multiple choice and Fill-in-the-blank test items, the quiz
205 platform can provide students with timely feedback, compared to other free test items, such as
206 Draw and Open ended, which are unable to provide immediate feedback.

207 **Figure 1**

208 *Quizizz question types*
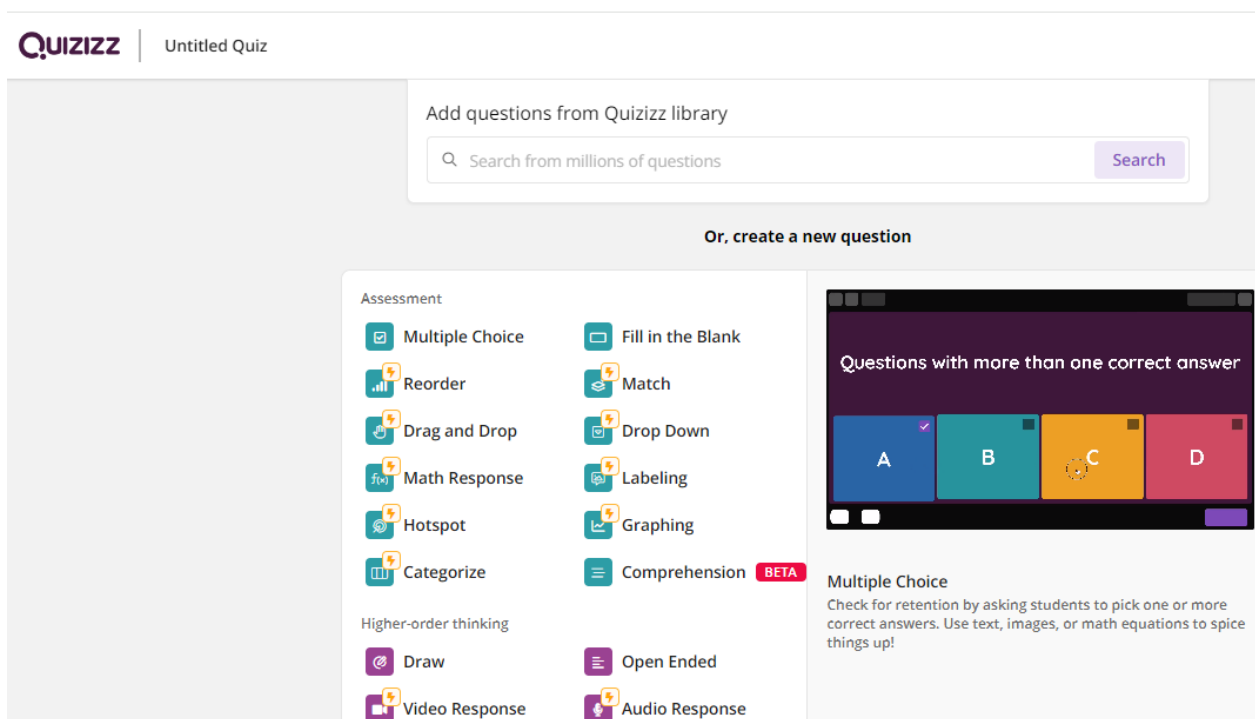
209

210 Feedback in Quizizz can be controlled, meaning that students can choose whether to receive
211 immediate feedback for each question and/ or receive feedback after submitting the quiz. In our
212 study, each correct response was shown to students after selecting an answer for each question
213 (see Figure 2). Additionally, students had the option to review all questions in the quiz after
214 completing it (see Figure 4). We conducted our study using this feedback mode because it was
215 the preference of our students in the current context. This mode of feedback, revealing correct
216 responses after selection, is similar to other popular quiz platforms used in our context, such as
217 Kahoot, Blooket and Bamboozle. While Quizizz shares this common aspect with other quiz
218 applications, it also incorporates additional features that focus on feedback. For example, it allows
219 students to view explanations for each correct response (as shown in Figure 3). However, since
220 the option to view explanations for each correct response is optional, there may be instances
221 where the quiz game lacks comments on the correct answers. In conclusion, the Quizizz platform
222 features both similarities and differences compared to other quiz games particularly in terms of

223 feedback. Therefore, gaining insight into students' engagement with feedback on this platform
224 can provide a better understanding of which features contribute to enhancing students'
225 engagement with feedback.

226 **Figure 2**   **Figure 4**

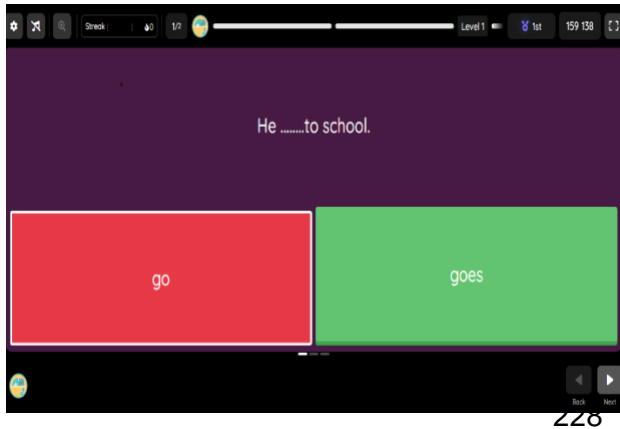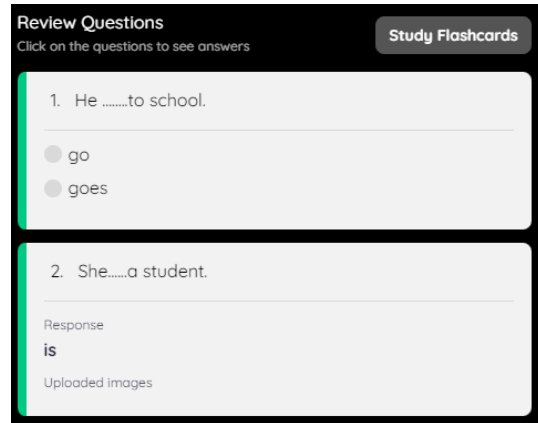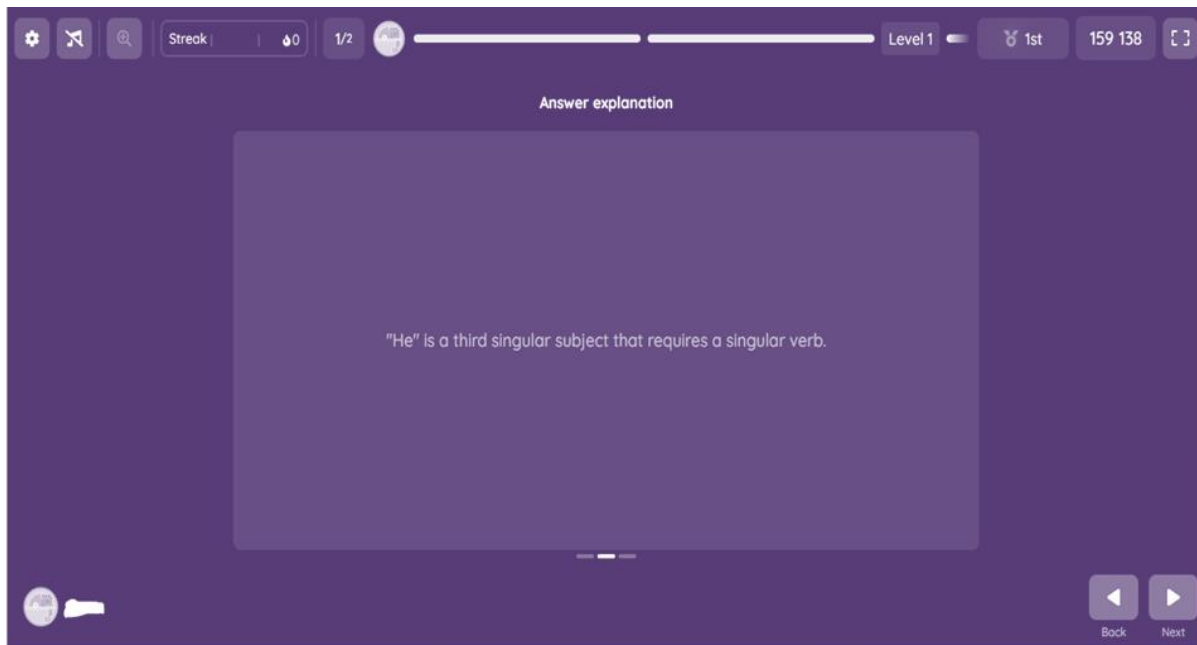227 *Correct responses shown in Quizizz*   *Quizizz review questions*

228

229 **Figure 3**

230 *Answer explanations in Quizizz*

231

232 **Participants**

233 294 first-year students who were enrolled in English preparation courses at a private university in
234 the southwest of Vietnam participated in this study. They included 149 males (50.7%) and 145
235 (49.3%) females from various disciplines, with ages ranging from 19 to 21. At the time of the study,
236 Quizizz had been integrated in classroom activities for over six months for the consolidation of
237 learned English Grammar and Vocabulary. The number of participants is about 14.7 times the

238 total numbers of the items in the questionnaire (20 items), which exceed the minimum participants
239 for qualified data as presented by Osborne and Costello (2004) who suggest a rule of thumb of
240 10 observations per item. Participants were selected using a convenience sample technique,
241 enabling the researchers to choose willing and voluntary participants for their study (Gay et al.,
242 2011). Therefore, by using this technique, we could select participants who are willing to share
243 their perspectives, which means that we could obtain productive results for our study. Participants
244 provided signed consent forms before completing the questionnaire or participating in focus group
245 interviews. To protect their identity, pseudonyms were assigned to each participant. This study
246 was approved by the Ethics Review Committee of the university where the authors have worked
247 with the code: Staff-KhueTV-MaiLTT15-SP23-02.

248 **Research Design**

249 We employed a mixed methods design, which combines both quantitative and qualitative
250 approaches to shed light on students' engagement with feedback in the Quizizz platform. This
251 design enables us to minimize bias and subjective perspectives in our results as suggested by
252 Creswell (2009) and promotes triangulation, enhancing the validity of our findings as argued by
253 Huminite-Peltomäki and Nummela (2006). In line with the purpose and research questions of our
254 study, we opted for an explanatory sequential design, where qualitative data explains the
255 quantitative results (Creswell & Creswell, 2018). First, we used a quantitative data to examine the
256 overall extent of students' engagement with feedback on the Quizizz platform. This phase
257 provided us with a broad perspective on how students interact with feedback in the platform.
258 Subsequently, the qualitative phase delves into detailed explanations of their engagement. As a
259 result, our research design is believed to allows us to gain in-depth insight into participants' views
260 on their engagement with feedback in the Quizizz platform.

261 **Research Instruments**

262 There are two main instruments in our study, including the questionnaire and focus group
263 discussion.

264 ***Questionnaire***

265 The questionnaire that comprised three constructs, namely cognitive engagement, behavioural
266 engagement, affective engagement including attitude and perceived usefulness toward feedback
267 adapted from the two validated questionnaires by previous scholars. Particularly, we adapted 16
268 items from the engagement scales developed by Man et al. (2021), and 9 items from the
269 engagement scale developed by Ali et al. (2015). Particularly, affective engagement included
270 eight items (from item 1 to item 8), behavioural engagement comprised 9 items (from item 9 to
271 item 17), and cognitive engagement had seven items (from item 18 to item 25). Participants rated
272 how much they agree or disagree with the items using a common balanced 6-point scale: *strongly*
273 *disagree* (1), *disagree* (2), *slightly disagree* (3), *slightly agree* (4), *agree* (5) and *strongly agree*
274 (6). The questionnaire was measured by the Statistical Package for the Social Sciences (IBM
275 SPSS) Statistics version 25.

276 We employed the Cronbach alpha coefficient to examine the internal consistency reliability of our
277 questionnaire that comprised multi-item scales. The internal consistency was examine to ensure
278 items are intercorrelated meaning that they reliably measure the same underlying construct

279 (Dörnyei & Taguchi, 2010). This scale of the internal consistency is typically indicated by a
280 Cronbach's alpha value falling between 0.7 and 0.9 (Creswell & Creswell, 2018). It can be
281 concluded that the questionnaire attains the internal consistency, which, in turn, reflects the
282 reliability of the instrument. In this sense, for the instruments of our study to be reliable, the
283 questionnaire must at least have the internal consistency.

284 A pilot test was carried out with 50 participants, an appropriate number as indicated by Johanson
285 and Brooks (2010) that the minimum number for a pilot test is 30, to ensure the reliability of the
286 questionnaire before it was administered to the participants. Three items were removed because
287 the Correlated Item-Total Correlations were below 0.3. Particularly, there was one item in affective
288 engagement ("Feedback in Quizizz makes me feel frustrated"); one item in behavioural
289 engagement ("I did nothing about comments in Quizizz that I could not understand"); and one
290 item in cognitive engagement ("I ignored comments in Quizizz that I did not understand"). After
291 removing the three disqualified items, the Cronbach's Alpha values of the questionnaire were over
292 0.7, indicating that the questionnaire was reliable (Creswell & Creswell, 2018; Taber, 2018).
293 Details were presented in the following table.

294 **Table 1**

295 *Cronbach's alpha for each factor in the questionnaire*

Factors	No of items	Cronbach's Alpha
Affective engagement	7	.864
Behavioural engagement	9	.860
Cognitive engagement	6	.784

296 We employed an Exploratory Factor Analysis (EFA) with Promax rotation was used in the study.
297 The result showed that 22 items were loaded into three factors. Two items were removed because
298 their factor loading was lower than the threshold 0.5 (Hair et al., 2018). There was one item in
299 affective engagement (Reading feedback in Quizizz is fun); one items in behavioural engagement
300 (When I did not understand feedback in Quizizz, I discussed the feedback with my classmates).
301 Additionally, two items in behavioural factors (When I did not understand feedback in Quizizz, I
302 used reference materials (e.g., dictionary and Internet); When I did not understand feedback in
303 Quizizz, I discussed the feedback with my teacher) were loaded into cognitive factor. We also
304 kept naming this factor cognitive engagement. The Kaiser-Meyer-Olkin Measure of Sampling
305 Adequacy (KMO) was at 0.958 and the initial eigenvalues, indicating the extent to which a factor
306 explains variation, were greater than 1, that demonstrates a significant portion of variation (Field,
307 2009). The significant level of Bartlett's Test was at .000, indicating that all variables were
308 correlated. Additionally, they accounted for 67% of all variances. Details about the results for EFA
309 were presented in the following tables.

310 **Table 2**

311 *Total variance explained*

Initial Eigenvalues			
Components	Total	% of Variance	Cumulative %
Affective engagement	11.015	55.077	55.077
Behavioural engagement	1.380	6.898	61.975
Cognitive engagement	1.002	45.011	66.986

312 **Table 3**

313 *Pattern Matrix*

	Factor		
Components	1	2	3
I found the feedback in Quizizz useful.	.888		
The feedback in Quizizz helped me to correct my errors.	.851		
The feedback in Quizizz helped me to understand what was wrong.	.850		
I like reading feedback in Quizizz.	.619		
The feedback in Quizizz motivated me to revise my answers.	.604		
Feedback in Quizizz makes me more interested in learning.	.535		
I tend to spend more time reading over feedback in Quizizz when I get a low mark.		.748	
I always look over feedback after each question in Quizizz.		.725	
I always look over feedback at the review sections in Quizizz.		.724	
I tend to focus more on things that need improvement rather than the things I have done satisfactorily.		.720	
I find the feedback helps me improve.		.686	
I would like to receive more feedback on my work.		.533	
I keep a record of all my feedback in Quizizz and refer to this again in future.			.860
I usually spend time reflecting on feedback after I have read it.			.674
I tried to understand feedback in Quizizz.			.652

I took note of the information I need to improve for future purpose.	.647
When I did not understand feedback in Quizizz, I used reference materials (e.g., dictionary and Internet).	.645
I look over previous feedback in Quizizz when preparing an assignment.	.612
When I did not understand feedback in Quizizz, I discussed the feedback with my teacher.	544
I tried to figure out the reasons for the errors in the questions.	519

Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 12 iterations.

Focus Group Discussion

Questions for the focus group interviews included three questions adapted from the interview questions developed by Man et al. (2021). The questions explored how students engage with feedback. Sample questions comprised: (1) How do you feel after having the feedback? (2) To what extent do you understand the feedback? (3) What do you do with feedback?

Three focus group discussions including five students in each group were randomly selected based on their responses to the question of whether they would like to participate in a focus group discussion at the end of the questionnaire. The average duration for each discussion lasted approximately 15 minutes via Google Meet. The discussions were recorded, transcribed, and then manually analysed on the basic of the thematic analysis guided by Braun and Clarke (2006).

Validity and Reliability of the Study

Validity and reliability are significant aspects when conducting research. Validity is concerned with whether the results are accurate or precise, while reliability refers to the findings being consistent and replicable, especially when applied in diverse contexts (Denscombe, 2010). To ensure the internal reliability of the research, we conducted a Cronbach alpha test. The results showed that the values of the Cronbach alpha for factors are over 0.7, indicating that our questionnaire is reliable (Creswell & Creswell, 2018; Taber, 2018). In terms of validity, our questionnaire was adapted from questionnaires validated by previous researchers, namely Man et al. (2021) and Ali et al. (2015). Furthermore, the results of the EFA indicated that the items are correlated and aligned with the factors identified by the theoretical framework, meaning that the questionnaire is valid in our study context. Additionally, we cross-checked the translation of the questionnaire and interview questions into Vietnamese and vice versa, as well as our coding. Specifically, we independently translated the questionnaire and interview questions into Vietnamese and coded the qualitative data. We then compared the results. Any discrepancies were negotiated until reaching an agreement.

Results

In this section, the results from both quantitative research and qualitative research are presented.

343 **Results from the Questionnaire**

344 A Descriptive Statistics Test and a One -sample t-Test were run to find out the answer to the first
345 question regarding the extent to which students engaged with feedback in Quizizz. The result was
346 revealed in the following tables.

347 **Table 4**

348 *Mean score of participants' engagement with feedback on Quizizz*

Components	N	Mean	SD
Affective engagement	294	4.9388	1.01264
Behavioural engagement	294	4.7421	1.00061
Cognitive engagement	294	4.5123	1.01540
General Mean	294	4.7311	.92690

349 **Table 5**

350 *One-sample t-Test of general means (Test value = 5)*

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Affective engagement	-1.037	293	.301	-.06122	-.1775	.0550
Behavioural engagement	-4.420	293	.000	-25794	-3728	-1431
Cognitive engagement	-8.235	293	.000	-48767	-6042	-3711
General Mean	-4.975	293	.000	-26894	-3753	-1626

351 As shown in table 4, the average mean of participants' engagement with feedback in the Quizizz
352 was quite positive (M= 4.7311, SD = .92690). In addition to this, the result from the one-sample t-
353 test was statistically different from the test value of 5.0 (t=-4.975, df=293, p=.000<0.05, mean
354 difference = -26894 see Table 5), which indicated that the participants engaged moderately with
355 feedback in the Quizizz. Among the three components, the affective engagement (M = 4.9388,
356 SD =1.01264) and the result from the one-sample t-test was the same as the test value (t=-4.975,
357 df=293, p=.301> 0.05, meaning that the participants engaged affectively with feedback in Quizizz.
358 Cognitive engagement (M = 4.5123, SD =.92690) was perceived as the lower ones.

359 **Results from the Focus Group Interview**

360 The findings provide insight into how the Quizizz platform might shape students' engagement with
361 feedback in terms affective engagement, behavioural engagement, and cognitive engagement.

The Affective Engagement

The students reported various feelings when they respond to feedback in the Quizizz, including happiness, excitement and sadness. The feelings were constantly repeated. Particularly, they said that

"When I saw feedback, I was little sad because my answers were wrong[...] (Participant 1 in group 3)

"When I had positive feedback, I was so excited, and I clapped the table." (Participant 1 in group 2)

"Whenever my answer was right, I was so happy." (Participant 1 in group 1)

In addition, all participants claimed that feedback is useful. One student, for example, explained why feedback is helpful.

"The Quizizz provides me with immediate feedback which helps me know what is wrong. I do not need to wait a long time to get feedback. Besides, feedback in the Quizizz is easy to remember, and lasts longer […]. I usually hesitate with the two out of four options before making final decisions. For example, once I did not know whether to choose the plural form or singular form. At that time, my final decision was wrong, then I saw the right one, which consolidated my knowledge." (Participant 5 in group 1)

Similarly, another participant confirmed the effectiveness of feedback in learning Vocabulary with Quizizz compared to non-gamified techniques.

"Like other classmates, feedback in the Quizizz helps me easily acquire target knowledge. The non-gamified technique such as writing down vocabulary to memorise them helps me learn vocabulary, but I will soon forget the words. However, Quizizz helps me remember vocabulary much longer." (Participant 2 in group 3)

Behavioural Engagement

Students negatively and positively conducted several behaviours in engaging with feedback. Five participants skipped the items they did not understand and did not have any plan to find out the explanation. *For instance,* Participant 2 in group 2 *told, "I skipped the items I did not understand. I did not pay attention to these items anymore."* The students provided the reasons their behaviour.

"*I ignored the sentences that I did not understand. I skipped the items and answered other questions. I did not even review these items or find more information about them. I did not have much time for such items although I would like to know. But I would revisit that knowledge before the exam.*" (Participant 1 in group 1)

Another student stated that, "*These sentences were not necessary. There were two or three statements in each quiz which were like the one I did wrong, so I could understand the target knowledge.*" (Participant 3 group 2)

The others reported their positive behaviours. First, for the questions that they can do well, most of them seemed to ignore it. However, they paid more attention to the tricky items.

"For the question that I had the correct choice I had a glance at it, but I spent more time looking at the difficult questions." (Participant 3 in group 1)

Students performed various feedback related activities such as read, search information from available sources, take note, review, and do the exercise again. Every student has their own way to engage with feedback. The popular activity is reading feedback. For example. *"I have enough time to look over the feedback immediately after the quiz or in the day after class, I often read it to understand."* – said Participant 3 in group 1. Several students reviewed the knowledge they noted from feedback for latter assignments. For example, Participant 2 in group 3 *told that: "Sometimes, I review the grammatical structure I noted when I have a written assignment."* One student reported that, *"I practice the question that I did not do well again to remember"*- said Participant 4 in group 1. However, some participants did not take notes because they reviewed the questions immediately to understand and were confident of their memory. For example, Participant 3 in group3 said, *"I do not take notes. What I need is understanding the questions. It is possible for me to remember without note taking."*

Cognitive Engagement

This section provides the data of students' feedback process from the effort to understand the feedback to what strategies they did to boost their understanding and increase their memory. First, most students reported that sometimes feedback was not comprehensive enough; they would like to know the explanation for the answers. Therefore, they would like to have the explanation for the correct answer added for each question.

"Feedback can partly trigger my memory. Like my friends, I would like to see the formulation/ explanation under the correct answers. English grammar knowledge is vast, so providing only the correct answers is not enough for fully understanding or recognizing the grammatical point." (Participant 2 in group 1)

Students also recommend the amount of the added information as following:

"Some difficult questions should have brief explanation. The explanation does not need to be too much detailed." (Participant 3 in group3)

Also, students reported that they would search for the explanation to enrich their understanding. Each student had their sources to understand the feedback such as themselves, classmates, the Internet or their lecturers. They stated

"I usually look over the questions that I do not do well, analysis what it is wrong and remember." (Participant 3 in group3)

"For the questions that I did not understand, I asked my classmates. I found that their explanations were understandable." (Participant 2 in group 1)

"When I thought my choice was right but actually it was wrong, I searched for an explanation online." (Participant 1 in group 2)

"For the question I would like to find the answer, I would search Google or ask my lecturer." (Participant 5 in group 3)

438 After understanding, students usually reported that they noted down the information to remember.
439 In addition, the note taken information was reported as a source for the students to rehearse
440 before doing any related assignments or exercises.

441 *"Like my classmates, I usually took notes on what I needed to remember. For grammar, I usually*
442 *wrote down the grammatical structures under the sentences. I reviewed the notes before the*
443 *exam and whenever I did the assignments that required such knowledge."* (Participant 2 in group
444 3)

445 One student described the cognitive effort while taking notes such as comparing the right and the
446 wrong ones in their notes to increase their memory.

447 *"I took note. I usually wrote down the grammar structures. I noted the wrong sentences by*
448 *underlining them in red and wrote the right one under them. Comparing two answers could help*
449 *me remember longer."* (Participant 1 in group 3)

Discussion, Implications, and Limitations

Discussion

452 This study aimed at exploring how students engage with feedback on Quizizz. The findings
453 indicate that participants moderately engaged with feedback from the Quizizz platform in terms of
454 affective engagement (M= 4.9388; SD=1.01264), behavioural engagement (M= 4.7421;
455 SD=1.00061) and cognitive engagement (M = 4.5123; SD=1.01540). Our findings support the
456 implementation of technological platforms in language learning and teaching to enhance students'
457 engagement with feedback. This is particularly aligned with other researchers who presented the
458 positive roles of technology-enhanced feedback, such as AbuSa'aleek and Alotaibi (2022),
459 Cavaleri et al. (2019), Deeley (2018), and Winstone et al. (2021).

460 In terms of the affective engagement, our findings are aligned with the framework, showing that
461 participants had both positive and negative experience toward feedback. Immediate responses
462 revealed the correct answer, causing students to feel excited or happy when their choice was
463 correct while a slight sense of disappointment emerged with incorrect answers. However, they all
464 found the feedback to be useful.

465 Regarding behavioural engagement, the findings are quite complex. Like the previous research
466 by Winstone et al. (2021, p.15), our students initially engaged with feedback through "surface
467 engagement", which involves activities like reading feedback. Notably, one student delayed
468 seeking an understanding of the feedback until the exam, which highlights the less significant role
469 of feedback process in this participant's perspective. However, another participant skipped an
470 unfamiliar item, recognizing that reviewing other resemble questions might help understand the
471 problem. Additionally, another participant stated that reading corrective feedback served as a
472 reminder of their previous knowledge. These instances suggest that surface engagement might
473 not necessarily have negative implications in our context. This finding supports for the role of
474 feedback in consolidating previous instruction or directly help students achieve learning outcomes
475 through quizzes, as suggested by Landers (2014). Some participants went beyond mere reading
476 the feedback. They took additional steps, such as consulting external available sources, to
477 understand the feedback. This contrasts with Winstone et al. (2021), where their participants
478 focused more on surface and mere surface engagement. The reason for the difference is the

479 unique nature of the platform. In this quiz game, the feedback and the scores are in the same
480 location, while in previous study, they were in separate places, which reported as a barrier for
481 engagement. Therefore, like previous studies by Winstone et al. (2021) and Deeply (2018), our
482 students expressed a preference for the convenience of the feedback exposure. For a quiz game,
483 we recommend that feedback comments should be added under the correct choice so that
484 students do not need to search online for additional information.

485 Concerning students' cognitive engagement, their engagement incorporated both deep and
486 surface strategies, consistent with the framework presented. These participants exhibited a
487 proactive approach to their learning by actively reviewing the questions that they answered
488 incorrectly. They sought to understand their errors by independently searching for the information
489 themselves or seeking clarification from available sources, such as classmates or lecturers.
490 These findings substantiate the vital role of e-feedback systems like the Blackboard learning
491 system as highlighted by AbuSa'aleek and Alotaibi (2022). Their study, through the lens of tutors,
492 reported that students tended to seek feedback explanations and engaged in discussions to
493 enhance their comprehension. Furthermore, these findings also confirm the retrieval theory and
494 McLaughlin and Yan (2017) that acknowledged the role of feedback from quizzes in encouraging
495 students to find out the explanations for the gap in their knowledge. What is more, participants
496 not only replayed the quiz multiple times but also took note on key information for further
497 reference, which was not reported by the previous studies on technology-mediated feedback. This
498 positive engagement attributes to the capabilities of quiz technology, as recommended by Rüth
499 et al. (2021) who concluded that the use of quiz app fosters students' self-regulated learning.
500 Additionally, insights from Burlacu et al. (2023) and Nah et al. (2014) suggest that gamification
501 features can enhance students engage with learning. Moreover, it is the nature of the Quizizz tool
502 that allows students to review their answers after playing and further practice synchronously at
503 their own space using the provided link. However, the decision whether to take notes on feedback
504 depends on students' abilities to retain the target knowledge. This variability in note-taking
505 practices aligns with the idea of individual difference in engaging with feedback, as explained by
506 Man et al., (2021). Some students refrained from taking notes because they were confident in
507 their understanding and ability to remember, whereas the others found note-taking essential for
508 future reference. Therefore, it appears that the absence of taking notes might not necessarily
509 indicate negative engagement. Through this engagement process, the participants demonstrated
510 their ability to manage feedback as well as understand their responsibilities and their lecturers'
511 roles in dealing with feedback, which is aligned with one of the characters of feedback literacy
512 identified by Carless and Boud (2018).

513 **Implications for Enhancing Students Feedback Literacy with a Quiz Game Technology**

514 The data support the implementation of the quiz game platform in enhancing feedback literacy.
515 Therefore, to leverage quiz games to enhance feedback literacy, certain features should be
516 incorporated into the quiz platform as indicated by our findings. Firstly, the platform should provide
517 students with prompt responses so that they can know the extent to which they master the target
518 knowledge and take further actions for learning improvement. Secondly, although the quiz game
519 can motivate students to seek explanations to enrich their own understanding of the target
520 knowledge, it is crucial to provide a concise explanation alongside the correct answer. This feature
521 aims to activate students' memory of the target knowledge learned from the lessons, minimising

522 the need to search for information from external sources, such as classmates, lecturers, or online
523 materials. Additionally, this quiz platform should include a review section so that students can
524 have more space to review all questions that they have just completed in the quiz, maximising
525 their exposure to the test items. This, in turn, enables them to undertake additional actions, such
526 as reviewing, understanding the correct choices, and taking notes, to further enhance their
527 learning.

528 Furthermore, insights from the interview data revealed that some students, demonstrating their
529 lower engagement with feedback, emphasised the significant role of teachers' debriefing section
530 for their students' understanding of the target knowledge. In this section, the students even
531 conducted further activities like taking notes what they have learned from teacher's review of the
532 quiz content. Therefore, implementing a debriefing section after playing games may prove vital in
533 consolidating students' understanding of feedback information.

534 **Limitations**

535 There are several limitations to our study. Firstly, our data were collected from one single
536 institution using convenience sampling method. Despite of its nature advantages, this method
537 may lead us to select the participations who were more engaged than others in the population.
538 However, to maximise the drawback, we made efforts to collect the data from as many participants
539 as possible. Secondly, the data were collected at a single point of time, which may inhibit the
540 generalization of the findings. More longitudinal studies should be conducted to explore whether
541 there are changes in students' engagement with feedback on the Quizizz platform.

542 <div align="center">**Conclusion**</div>

543 The current study contributes to understanding how students engage with feedback affectively,
544 cognitively, and behaviourally in the process of playing games on a quiz platform, drawing from
545 the framework of engagement by Fredricks et al.(2004). The findings show that students
546 moderately engaged with feedback, with the highest engagement observed in the affective
547 dimension and the lowest in cognitive dimension. This finding revealed the role of the gamified
548 quiz in consolidating the target knowledge. Since playing quiz games can activate students'
549 knowledge which they have learned, several students might not need to invest lots of cognitive
550 effort to understand and memorise the feedback from the quiz items. Consequently, the mean of
551 the cognitive efforts was relatively lower. Additionally, their process of engagement with feedback
552 was diverse, demonstrating varying extents of engagement among individuals with both positive
553 and negative feelings. Some merely reading feedback and skipping it, while others conducted
554 further actions to understand it, highlighting the effect of quizzes with feedback. Preferences for
555 activities like taking notes for revision varied among students reflecting the complexity of
556 individuals engagement with feedback.

557 More importantly, through students' engagement with the quiz platform, this study highlighted the
558 significant role of gamified quiz platform in enhancing students' feedback literacy. Although
559 instances of participants skipping the feedback for the items they did not understand and
560 progressing to the next ones were reported, the majority acknowledged the potential benefits of
561 feedback from quiz for their learning. In the same vein, they demonstrated their understanding of
562 the value of feedback for their learning, their willingness to understand it, and their eagerness to
563 employ various strategies, such as note-taking, reviewing, or reusing the target language to aid

564 their memorisation. Furthermore, participants also provided insightful suggestions to further boost
565 their engagement with feedback, such as adding the explanations next to correct answers or
566 conducting follow-up debriefing sessions facilitated by teachers.

567 In addition to these findings, we also fine-tuned the previous questionnaires by employing EFA to
568 develop the current one for measuring students' engagement with feedback in a quiz tool. This
569 refinement confirmed the implementation of the framework in measuring students' engagement
570 with feedback from a gamification platform.

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