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EFL LEARNER ENGAGEMENT IN GAMIFIED FORMATIVE ASSESSMENT: A PERCEPTION STUDY ON QUIZIZZ

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Abstract. Among several technological applications in education, Quizizz is an increasingly popular gamification platform to deliver tests and e-quizzes in different teaching contexts. However, the discussion about how gamified assessments via online platforms influence teaching and learning is neither profoundly theorized nor well supported with empirical evidence. The current research attempts to explore Vietnamese university students' perceptions of the impacts of gamified formative tests on Quizizz by adopting the tripartite framework of affective, behavioral, and cognitive engagement. The sample includes 54 English-majored students who were taking a course in designing tests for young language learners. Based on data collected from a questionnaire and semi-structured interviews, the current research found students' highly positive perceived affective engagement in Quizizz-based formative tests. Their self-report active participation in the e-quizzes and follow-up teacher/peer feedback sessions demonstrated high levels of behavioral engagement. Students were, however, slightly less in agreement with the benefits of Quizizz in enhancing their self-monitoring and critical thinking skills. Some reservations remain about technical problems during quiz administration and the use of scores in Quizizz gamified tests for summative assessment purposes. The findings inform pedagogical implications about the use of gamified platforms to better engage students effectively, behaviourally, and cognitively.

Keywords: Quizizz; Formative assessments; Learner engagement; Affective, behavioural, and cognitive engagement.

1. Introduction

Born in the 21st century, learners at different educational levels are called "digital natives", being owners of smart devices and experienced users of Internet services. Thus, the education system is faced with the challenge to keep abreast of technological advances and tailor itself to the needs of digital natives to better support their learning [5]. Technology has gradually taken on vital roles in different teaching and learning contexts. In the English as a foreign language (EFL) context of Vietnam, various digital tools have been used to supplement

traditional modes of learning, especially gamification applications such as Kahoot, Quizizz, or Plickers. The increasing popularity of such tools has enabled technology enhanced assessment activities, allowing for flexible timing, adding fun to lessons while enhancing the effectiveness of assessment and feedback practices [7]. The application of gamification tools is also believed to increase students' motivation and engagement in learning activities as they promisingly improve learner participation and focus their attention [5, 10]. In addition, gamification can motivate learners by turning non-game contexts into game-like situations [9].

Zainuddin et al. [21] presented some key advantages of gamification tools for formative assessment in the classroom, including opportunities for fun and friendly competition, encouragement of multi-tasking skills, and timely feedback to stakeholders. This is because gamification has features like scores, badges, rankings, and rewards which both allow for immediate feedback and appeal to learners' interest. Despite the growing popularity of gamification platforms, their applications in classroom contexts are under-researched with only a small number of studies having been conducted to evaluate their impacts on learning [e.g., 18, 20]. The review of the literature also shows the most frequently discussed construct in relation to the application of gamification platforms is learner engagement and how these platforms impact the students' multidimensional engagement in their learning. Yet, engagement has been theorized quite diversely in the literature, and not all empirical studies have elaborated on the different aspects of engagement all together [20]. Drawing on a handful of studies investigating the use of gamification for formative assessment purposes [e.g., 20, 21], the current research utilizes the key concepts in learner engagement to examine how a popular gamified platform, Quizizz, impacts university students' engagement in academic activities in the EFL context of Vietnam.

2. Literature Review

2.1. Learner engagement

There have been various conceptualizations of the construct of "student engagement" [20]. However, researchers generally agree on the multidimensionality of this construct [4; 13; 20]. Most common conceptualizations consider three dimensions of engagement, including affective, behavioral, and cognitive, although researchers have raised the concern that there may be conceptual overlap across these three [11; 15]. Affective engagement refers to students' emotional reactions such as interest, boredom, happiness, sadness, and anxiety [16]. Behavioural engagement, on the other hand, refers to students' involvement in learning and academic tasks as demonstrated in such behaviours as making efforts, persisting in completing

tasks, paying attention, asking questions, and engaging in class discussions. Among the three dimensions, cognitive engagement seems to be less consistently defined in the literature. Learners who are cognitively engaged tend to be able to self-monitor and use strategies to regulate learning [3, 14].

Student engagement has often been discussed in light of theories related to motivation, learner goals, and learning strategies. For example, affective engagement can be considered from motivational perspectives which highlight students' energized emotional states such as enthusiasm, interest, and happiness. These positive emotions then translate into behavioural engagement via students' efforts, attention, and persistence in learning activities [17]. Similarly, Csikszentmihalyi's [2] flow theory points to enjoyment and interest as demonstrations of affective engagement, and concentration/absorption as cognitive engagement. Unlike Csikszentmihalyi [2], Connell and Wellborn [1] operationalised cognitive engagement as students' capacity to work hard, to flexibly solve problems, and to cope with challenges and failures. . Learning theories, on the other hand, associate cognitive engagement with students' use of strategies and self-regulation. Weinstein and Mayer [19], for example, discussed learner engagement in relation to students' use of either deep or surface-level strategies. They generally posit that more cognitively engaged learners tend to use deep strategies by expending more mental effort, making more connections between ideas, and thus achieving greater understanding. Metacognitive strategies include planning, monitoring, and regulating one's efforts to complete learning tasks, while learning strategies can be rehearsing, summarizing, organising learning materials, and making efforts to remember the learned content.

2.2. Gamification for formative assessments

Gamification is increasingly used in education for various benefits it brings to learners, including enhanced motivation and engagement, greater learner participation and interactivity, and better knowledge acquisition [5]. Gamification, with various tools thanks to the current technological affordances, generally involves the use of scores, badges, rankings, rewards, and immediate feedback [21]. While learners enjoy extra fun as they engage in gamified learning and assessment activities, classroom teachers can collect evidence about their learners' performance and keep track of their progress with the aid of technological features inherent in gamification platforms for easy storage and convenient retrieval of data [8].

Zhang and Fang [22] identified three basic elements of games: goal-focused activities, reward mechanisms, and progress tracking. In properly designed learning activities, students are instructed to complete specific tasks to achieve expected learning outcomes, thus giving

them a sense of goal orientation. In e-quizzes on Quizizz, for example, students are asked to complete a series of questions and gain good scores as evidence of their progress and mastery of the learned materials. In terms of rewards, different gamification apps offer different ways to motivate learners. For instance, leaderboards which show the best students in an activity, stars, or accumulated scores are all different reward features to praise students for their good performance in gamified assessment activities. Progress tracking, a great bonus of gamification platforms, helps teachers and students keep track of their progress towards goals in games, which "parallels the significance of tracking learning processes, that is to identify the remaining tasks required to win in the game context, or to achieve the desired learning outcomes for the instructional context" [22, p. 8].

2.3. Quizizz

2.3.1. What is Quizizz?

Quizizz is a game-based application with several features that may appeal to learners of different age groups. Quizizz is equipped with memes, themes, options for choosing avatars, and background music to engage learners [21, 23]. Quizizz has full game features as it allows for different ways of organizing gamified assessment: a live quiz in class where students take part in short assessment activities using their personal electronic devices, asynchronous mode where teachers can assign quizzes as homework tasks for students to complete at home with the results being recorded for teachers' record-keeping, and the paper mode for classes where students do not have their own devices to play the game synchronously. In the third mode, the needed devices are the computer to show students the questions, printouts of Q-cards for students to respond to questions, and the teacher's smartphone to scan students' answers. For live quiz and homework modes, Quizizz is flexible in terms of whether students can reattempt the questions with the additional feature of redemption questions after their first failed attempts so that they can review the lessons better and improve performance. Probably the most exciting mode is the live quiz which can be conducted in the team, individual, or test formats. In this mode, students can see live rankings on the leaderboard. Quizizz also keeps records of all students' results, as shown in Figure 1, which can later be downloaded in Excel files. Teachers can go back to these reports and look at individual students' performance on each question if needed.

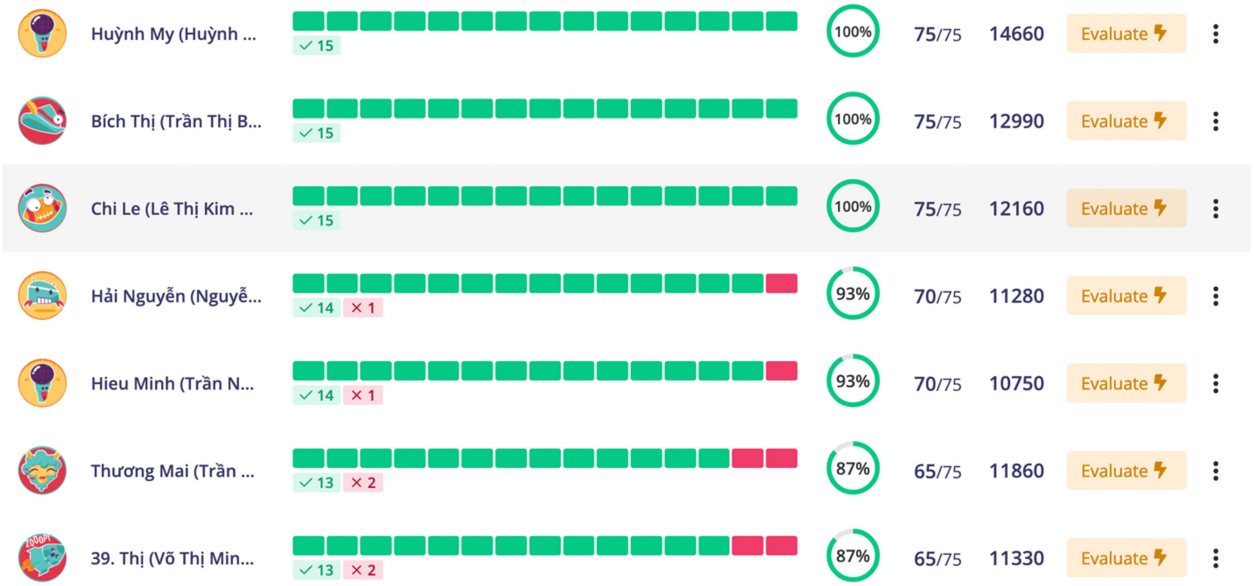

Figure 1. Records of students' performance on Quizizz.

2.3.2. *Previous research on Quizizz*

Quizizz is among the most popular gamification platforms in different courses at different educational levels. Previous research on Quizizz has been conducted in diverse teaching contexts, from tertiary education to secondary school levels. There seems to be overall positive perceptions of the implementation of Quizizz for gamified learning and assessment activities in class.

Suo and Zalika [18] conducted a study on students' interest in Arabic lessons with the use of Quizizz gamified tests towards the end of three class meetings among 85 university students. Students' engagement in taking these tests was very positive, as reported in questionnaire data about their participation and efforts to answer questions, as well as their concentration on the topic of the lessons. Zuhriyah and Pratolo [23] examined students' perceptions of Quizizz as a formative assessment tool via the use of semi-structured interviews with university students in Indonesia. Perceived effects of Quizizz application include students' improved confidence, enhanced motivation, stimulated interest, and their better reading ability. Such positive perceptions were accounted for by the fact that the use of Quizizz helped students receive instant feedback, which aided them in understanding the reading materials better. Also, anonymity as a game feature on this application lifted students' affective filter, making them

more confident in taking part in learning activities. Taking a quantitative approach to data collection via a survey, Jannah et al. [6] explored EFL high school students' perceptions of Quizizz-based English tests as an alternative for traditional paper-and-pen tests. The game-like context of a Quizizz-based test was well received by the learners, with the added flexibility of students' choice as to when and where to complete the tests at their own will.

Some studies compared the effects of Quizizz with other gamification tools. Zainuddin et al. [21] conducted a quasi-experimental study on 94 Indonesian secondary students from three different science classes, using three e-quiz tools Socrative, Quizizz, and iSpring LMS for formative assessment. Students also completed questionnaires surveying their perceived levels of learning engagement, followed by individual interviews with a subsample of 18 students who answered questions about their experiences and perceived engagement in gamified learning instruction and e-quizzes. Main findings indicated students' motivation in quiz competitions after lessons, with participants in the Socrative and Quizizz groups being more emotionally engaged.

The review of literature shows that although a few researchers have adopted the tripartite framework of affective, behavioral, and cognitive engagement for their examination of gamified activities in classrooms, what comprises each of these three dimensions varies across studies. Also, most of these research efforts fail to relate their discussion about the use of Quizizz-based gamified assessments to learning theories to explore the close-knit relationship between gamified learning and assessments. The current research, therefore, explored the impacts of gamified assessments via Quizizz from the three dimensions of affective, behavioral, and cognitive engagement. Students' motivation, learning goals and strategies will be taken into account to conceptualize the three dimensions of engagement for a systematic examination of Quizizz-based assessments on EFL students' learning. The study is guided by three research questions:

(a) What is EFL tertiary students' perceived level of affective engagement with gamified Quizizz-based formative assessments?
(b) What is EFL tertiary students' perceived level of behavioral engagement with gamified Quizizz-based formative assessments?
(c) What is EFL tertiary students' perceived level of cognitive engagement with gamified Quizizz-based formative assessments?

3. Method

3.1. Participants and context

54 participants who were pre-service EFL teachers took part in the current research. Participants' age ranged from 20 to 21 years old. In this course entitled "Designing Tests for Young Language Learners", the participants had lessons on key theoretical concepts in language testing, principles of designing English language tests for primary school students, and test item types. For the practical side of the course, they learned to write different test items to assess learners' language skills in English (i.e., listening, reading, speaking, and writing) as well as their English language knowledge (i.e., lexical and grammatical knowledge). All of the participants had quite extensive experience taking mini-tests on Quizizz for previous courses they took. For the current course when data were collected for this research, classes took place in the face-to-face mode. Over a 15-week semester, three quizzes were delivered at the end of the fifth, ninth, and twelfth class meetings using Quizizz for formative purposes to review learned knowledge about test design principles, theoretical concepts, and awareness about different item types. All of the questions in the quizzes were in either multiple-choice or true/false format. Figure 2 illustrates a multiple-choice test item from the quizzes.

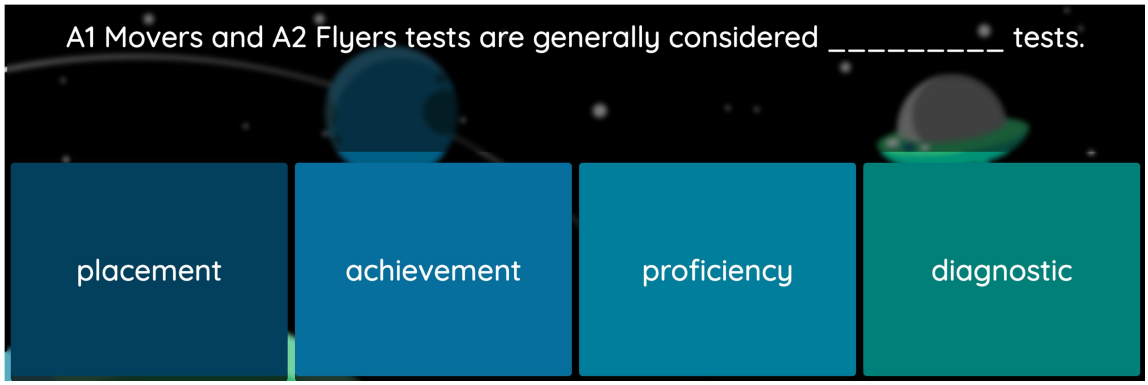

Figure 2. Screenshot of a multiple-choice item from Quizizz used in the formative tests

The students took part in the current research on a voluntary basis. They were informed of the research purpose prior to their participation and their responses to the questionnaire were anonymized. For interviewed students, they were contacted and invited by the researcher to attend individual interviews after they completed the questionnaire. The researcher got each student's permission to video record the interviews.

3.2. Data collection and analyses

The data for this study come from self-report survey questionnaire completed by the 54 participants and semi-structured individual interviews with six purposely selected participants.

3.2.1. Questionnaire

The questionnaire surveyed the students' perceived engagement levels in Quizizz-based activities for formative assessment in this course. Three major sections made up the questionnaire, with each cluster comprising five-point Likert-scale questions, corresponding to the three dimensions of behavioural, cognitive, and affective engagement. Each of these dimensions is operationalised in light of students' performance in gamified Quizizz-based formative tests. Figure 3 provides details about the content of each cluster and the items in each cluster.

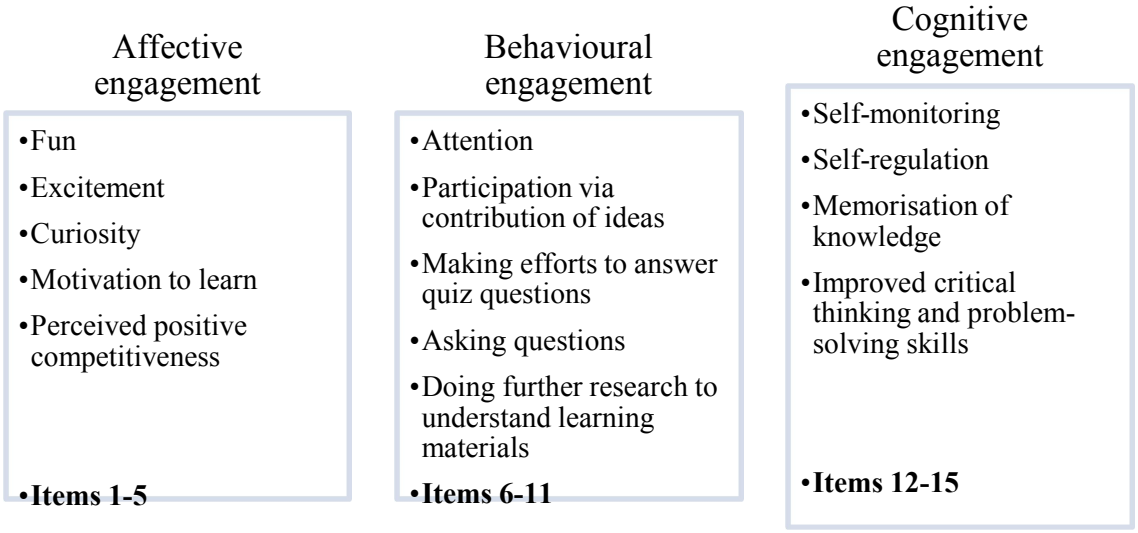

Figure 3. Components of affective, behavioural, and cognitive engagement perspectives.

Each questionnaire item used a 1-5 Likert scale with the five response options: 1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree. As Figure 3 shows, three aspects of student engagement in Quizizz-based formative tests were assessed, with four items for emotional engagement, six items for behavioural engagement, and five items for cognitive engagement. Most of these items were adapted from the questionnaire in the study conducted by Zainuddin et al. [21] for its great relevance to the construct of

engagement in the current research. Reliability was calculated using Cronbach's Alpha for each of the three clusters, all showing acceptable internal consistency ($\alpha = 0.897$, $\alpha = 0.799$, and $\alpha = 0.836$ for emotional, behavioural, and cognitive engagement, respectively).

The questionnaire data were analysed using the Statistical Package for the Social Sciences (SPSS) version 27.0 to produce descriptive statistics with mean, standard deviation as well as frequency counts and percentages of students' choices across the five response options for each statement.

3.2.2. Semi-structured interview

Based on informal classroom observation and questionnaire data, six participants were purposefully selected for in-depth interviews. For representativeness, two participants were among the low engagement group, two from the average engagement group, and two from the high engagement group. All the interviews were video recorded with participants' permission. Table 1 presents detailed information about the six interviewed students who are identified by pseudonyms.

Table 1. Interview Data Sources

Student	Perceived engagement level	Observed engagement level	Interview length
1. Xu	Low	Mid	30 minutes 19 seconds
2. Mi	High	Low	24 minutes 29 seconds
3. Duyen	Mid	Mid	23 minutes 10 seconds
4. Hung	High	High	23 minutes 28 seconds
5. Kha	Low	Low	22 minutes 39 seconds
6. Lien	Mid	Mid	24 minutes 51 seconds

The interviews were conducted with each participant using their L1, Vietnamese via Google Meet. The recorded interviews of the six students were then transcribed verbatim for thematic inductive coding. The interview questions were structured around the three

dimensions of learner engagement as in the questionnaire, with probing questions to dig deeper into their perceptions regarding the use of Quizizz for formative tests towards the end of class sessions. Coded excerpts related to the themes of affective, behavioral, and cognitive engagement were translated into English and checked for accuracy by a colleague in the division of Translation and Interpretation who had had more than ten years practicing as a professional Vietnamese/English translator and translator trainer in the Faculty of English of the university where this research was conducted.

Themes and sub-themes emerge from the inductive coding process, including the benefits of using formative tests via the gamified platform Quizizz for students' affective, behavioral, and cognitive engagement, some challenges experienced by students during their performance on the tests, potential values of Quizizz for tracking students' progress on the teachers' part, and students' suggestions for best implementation of Quizizz-based formative assessments.

4. Findings

4.1. Students' Affective Engagement

Table 2 presents details about students' perceived affective engagement in Quizizz-based formative tests. A large majority of students (85.2%) agreed that they were excited about the assessment on Quizizz. A similarly high percentage (88.8%) of all students expressed agreement and strong agreement that the course became more interesting thanks to the Quizizz-based formative tests. More than 80% of the students agreed/ strongly agreed that they were motivated by the positive competition generated in the gamified tests, and their curiosity about the answers and their scores was aroused when they took part in the formative assessments via Quizizz. In general, students demonstrate high agreement level with the statements surveying their affective engagement in Quizizz-based formative assessments, with the mean scores of all their answers for each statement being of a high level (ranging from 3.91 to 4.31). This shows their positive affective responses to the Quizizz-based formative assessment activities.

Table 2. Students' Perceived Affective Engagement in Quizizz-based Formative Tests (n=54)

Statement	***Mean***	***SD***	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1. I am excited about the assessment on Quizizz.	**4.07**	**.696**	0	1 (1.9%)	8 (14.8%)	31 (59.3%)	14 (25.9%)
2. Short quizzes on Quizizz boost our motivation via positive competition.	**4.19**	**.702**	0	0	9 (16.7%)	26 (48.1%)	19 (35.2%)
3. I am curious about the answers and my scores when having the assessment on Quizizz	**4.31**	**.469**	0	0	0	37 (68.5%)	17 (31.5%)
4. I think this course is interesting thanks to the incorporation of formative assessment activities on Quizizz.	**4.15**	**.656**	0	1 (1.9%)	5 (9.3%)	33 (61%)	15 (27.8%)
5. I want to devise short quizzes on Quizizz for my friends to review the lessons.	**3.91**	**.734**	0	1 (1.9%)	14 (25.9%)	28 (51.8%)	11 (20.4%)

The interviews lend some support to the questionnaire data, with several positive comments on the administration of formative tests via Quizizz. Students' appraisal of Quizizz mainly concerns the convenience of this gamification platform for testing students' knowledge gained from this course. The following comment covers the key reasons why the use of Quizizz boosts students' affective engagement in the formative assessment activities:

> *I like Quizizz because the questions can summarize most of the knowledge I already learned, and thanks to that I can review the lessons better. I generally love online platforms like Quizizz*

because I can always access and retrieve the information for revisions. Therefore, doing tests on Quizizz does not put stress on me at all; instead, I really enjoy doing tests on this tool because it is like playing a game. (Duyen)

Other students also report on the gamification features which excite them, including bonus points for correct answers, positive competition, the sound effects and images that support the questions, all of which provides a break from the lesson routines. Table 3 summarizes the aspects contributing to the positive affective engagement in formative tests on Quizizz.

Table 3. Interview Excerpts on Benefits of Quizizz-based Formative Assessments for Students' Affective Engagement

Benefits	**Number of comments**	**Sample comments**
Positive competition	4	*- If you do tests on Quizizz, the class atmosphere becomes more exciting as we compete for higher ranking by making efforts to have correct answers more quickly. (Xu)* *- Quizizz can motivate students because it promotes learning and positive competition among the students. Anyone who tops the leaderboard must be very proud of himself. (Hung)*
Excitement thanks to gamification features	6	*- I am excited about Quizizz-based formative tests because of the sound effects and images that accompany the questions. (Thu)* *- Quizizz also allows us to gain bonus points if we get four straight correct answers. By getting bonus points we became more excited. (Xu)*
Diversity to class routines	2	*I think if we use Quizizz right after each lesson for a mini-test, that would be great. The use of a test on Quizizz is a break from the lecture routine. Students have already listened to the lecture, and now they have the chance to do something different, which excites them by adding variety to the ways classes are conducted. (Lien)*
Convenience	2	*- You can instantly know your test results rather than wait for a long time to get any feedback and scores. (Lien)*

- It's very convenient and user-friendly, as the questions are clearly laid out. (Mi)

Beside the positive comments, however, four of the six interviewed students point out that using Quizizz as a gamified platform for formative tests can be a stressful experience because of the time pressure. The following comments illustrate this point:

A lot of my friends were not interested in the Quizizz-based tests as we feel stressed … It would not be a good idea to use Quizizz to conduct summative tests because students can panic when trying to remember learned knowledge to do tests within time limits. (Mi)

Time pressure is a big issue. If we are allowed to have 60 seconds, that is too much. 30 seconds is kind of OK, but the way the countdown clock is ticking away really stresses us out because we need to pay attention to the time and read the questions at the same time. (Xu)

4.2. Students' Behavioral Engagement

Table 4 provides detailed information about students' perceived behavioral engagement in Quizizz-based formative tests. A large majority of all of the students agreed or strongly agreed that they made great efforts when answering the questions in the Quizizz tests, paid attention to the teacher and peer feedback about the quiz, with more than 90% students choosing the "agree" and "strongly agree" options for these statements. For the statements asking students about their active behavioral engagement in learning from the formative tests, including participation in discussing the answers to quiz questions with the teacher and peers and doing further research to clarify issues they did not do well in the tests, over 80% of the surveyed students selected the "agree" and "strongly agree" options. Students were, however, less proactive in asking questions to their teacher and peers if they were still unsure about things in the Quizizz-based formative tests (M = 3.76, SD = .671), with 37% neither agreeing nor disagreeing with this statement. The remaining 63% agreed that they would raise questions if they found certain things unclear.

Overall, all of the statements surveying students' perceived attention in class following the Quizizz-based tests receive a very high level of agreement (M = 4.28 to 4.39), with low variability among the students' answers (SD = .564 to .609). Students also demonstrated a high level of agreement with statements about their active engagement in the formative tests on

Quizizz, including participation in discussing the answers to quiz questions and doing further research to seek answers to questions they did not do well in those tests (M = 4.04 and 4.09; SD = .699 and .734).

Table 4. Students' Perceived Behavioral Engagement in Quizizz-based Formative Tests (n=54)

Statement	***Mean***	***SD***	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
6. I made great efforts when answering the questions in the Quizizz tests.	**4.39**	**.564**	0	0	2 (3.7%)	29 (53.7%)	23 (42.6%)
7. I was attentive to the feedback provided by the instructor after the quiz on Quizizz was over.	**4.31**	**.609**	0	0	4 (7.4%)	29 (53.7%)	21 (38.9%)
8. I was attentive to the questions, the answers, and feedback from my peers during the feedback session after the Quizizz tests.	**4.28**	**.564**	0	0	3 (5.5%)	33 (61%)	18 (33.3%)
9. I participated in the discussion of quiz questions and answered the instructor's questions.	**4.04**	**.699**	0	1 (1.9%)	9 (16.6%)	31 (57.4%)	13 (24.1%)
10. If I am still unsure about certain points in the quiz, I could raise questions to my instructors and peers to work out the issues.	**3.76**	**.671**	0	0	20 (37%)	27 (50%)	7 (13%)

11. I continued to refer to materials to clarify issues I did not do well in the Quizizz tests.	**4.09**	**.734**	0	1 (1.9%)	9 (16.6%)	28 (51.9%)	16 (29.6%)

Students' verbalizations in the interviews clarify the questionnaire results. For those learners, a web-based platform like Quizizz allows them to review the questions on their own when needed. They generally considered Quizizz as a means to conduct further self-research on different questions they attempted for this course. Some of them were self-reliant rather than sought teacher and peer support straight away, which explained why a lower percentage of learners agreed with the statement about raising questions in class about quiz questions they did not do well. Duyen elaborated on this,

> *I can always go back and retrieve the questions for revision… I want to mention the test a few days ago. I missed some important information in class, but doing the formative test on Quizizz helped me realize things I needed to make up for so that I can relearn the materials*.

Another student, Lien, stressed that for the test questions on Quizizz that she was not sure about, she would refer to different resources to find the explanations and correct answers. If the questions are too tricky and she could not make sense of the answer herself, she would then ask the teacher or peers. This is also an idea expressed by Hung, "*If I got a wrong answer on Quizizz, I often realized why it was wrong. But for those I was unsure about, I would look up some information to double check*". He also stressed his great efforts to do well in Quizizz-based formative tests to remember the learned materials well. Similarly, Kha demonstrated persistence in getting all the answers right to master the learned knowledge and get ready for the final test. She said,

> *Whenever I got a wrong answer, I would take a screenshot for record so that I can review this question more carefully at home and prepare myself for the end-of-term test. If I had some incorrect answers, I would access the link again to retry the quiz; then I tried to remember the materials as well as the correct answers. I would reattempt the questions until I could get the right answers*.

Despite these positive comments regarding how Quizizz-based formative tests encourage students to complete the questions and understand the learned materials, Mi mentioned that it was sometimes not easy to enter Quizizz games compared to other gamified platforms such as

Kahoot. Technical problems could also emerge as the game progressed, preventing some students to complete all the questions in the tests.

4.3. Students' Cognitive Engagement

Table 5 shows that most of the students expressed agreement or strong agreement with the statements about the benefits of Quizizz-based formative tests in helping them to monitor their own learning (74.1%), enhance critical thinking (70.4%) and problem-solving skills (85.2%), and consolidating the learned knowledge after the lessons are over (81.4%). About one-fourth of the students were undecided about the effects of Quizizz-based formative tests on their critical thinking skill development. Very few students disagreed with these benefits, with only two cases for critical thinking skills and one for knowledge consolidation. Overall, students had positive perceptions about their cognitive engagement in gamified assessments via Quizizz, with all of the statements receiving high levels of agreement (M = 3.87 to 4.07; SD = .610 to .778).

Table5 . Students' Perceived Cognitive Engagement in Quizizz-based Formative Tests (n=54)

Statement	***Mean***	***SD***	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
12. I was able to monitor my learning progress thanks to formative assessment activities on Quizizz.	**3.98**	**.714**	0	0	14 (25.9%)	27 (50%)	13 (24.1%)
13. I was able to develop critical thinking skills during the Quizizz formative assessment activities.	**3.87**	**.778**	0	2 (3.7%)	14 (25.9%)	27 (50%)	11 (20.4%)
14. We were able to solve problems related to the questions in Quizizz-based tests via discussion and evaluation sessions.	**4.07**	**.610**	0	0	8 (14.8%)	34 (63%)	12 (22.2%)

15. I was able to remember the knowledge of the course better after Quizizz tests.	**4.00**	**.673**	0	1 (1.9%)	9 (16.7%)	33 (61%)	11 (20.4%)

In the interviews, students' comments add support to the questionnaire data in terms of the benefits of Quizizz-based formative tests for the internalization of learned knowledge. The recurring themes that emerge in interview data are explained in Table 6.

Table 6. Interview Excerpts on Benefits of Quizizz-based Formative Assessments for Students' Cognitive Engagement

Benefits	**Number of comments**	**Sample comments**
Understanding and retention of knowledge	6	*- I support the view that a short quiz on Quizizz towards the end of the lesson can help me remember the learned contents, which is good for revision later on. (Lien)* *- I was quite lazy taking the paper-based tests. With Quizizz, it is more convenient to review all the questions as well as the answers, making it easier for me to remember the learned knowledge. (Xu)*
Improved concentration during tests	3	*Doing tests on Quizizz, I concentrated on the questions more effectively as I was not easily distracted. Everyone else was also focused on their test, so there was no distraction. (Lien)*
Self-regulation of learning	4	*- The results were recorded, and this allows us to know what we did well and not so well. Based on this information, we could conduct self-study and improve our own performance. (Hung)* *- Whenever we got a wrong answer, the instant feedback let us know straightaway. If I didn't know why my answer was incorrect, I would do further research to find out the explanation. (Hung)*

Added to the benefits for students, the interviewed students also point out some potential benefits for teachers. Via the use of gamified tests on Quizizz for formative

assessments, teachers can keep track of individual learners' progress and assess students' knowledge acquisition:

> *The teacher can easily gather evidence about how much knowledge the learners have understood and remembered after the lesson. This is a quick and convenient way as the teacher does not need to write anything on the board; instead, she can just design the assessment tasks on Quizizz. (Thu)*

Following these comments, the interviewed students provide some suggestions regarding the applications of Quizizz-based formative assessment tasks in class. They believe that gamified Quizizz-based tests should be applied as a review activity at the end of the lesson or as warm-up activities before a new lesson. This way, tests delivered on Quizizz contribute to formative assessments to benefit both learning and teaching. The students also recommend against using Quizizz tests for summative purposes where students' performance is counted as part of their final scores for this course to avoid causing stress among learners.

5. Discussion and Conclusion

This study examined 54 tertiary Vietnamese EFL students' perceived levels of affective, behavioral, and cognitive engagement in formative tests delivered via the gamification platform Quizizz. Overall, students expressed high levels of agreement with the benefits of using Quizizz in enhancing their engagement in learning.

Concerning affective engagement, the use of Quizizz-based formative tests stimulates students' excitement, curiosity, and interest in the assessment tasks following the lessons. A large majority of the students also concurred that Quizizz motivates them to engage in the positive competition with peers during the tests. Such findings corroborate earlier research conducted by Suo and Zalika [18],Zuhriyah and Pratolo [24], and Zainuddin et al. [21]. Besides, Quizizz is perceived to be a convenient platform to conduct formative tests thanks to its gamification features of goal orientation, reward mechanisms, and progress tracking. By taking tests in a game-like context on Quizizz, students could enjoy diversity to learning activities. Positive emotional responses were accompanied by students' positive behavioral engagement, demonstrated through their great efforts in completing test questions, paying attention to teacher and peer feedback, participating in class discussion following the quiz, and referring to external resources beyond class meetings to improve understanding. These insights reinforce previous findings about Quizizz's positive influence on learners' active participation in lessons [e.g., 12, 18, 24]. Built-in features in Quizizz allow for convenient retrieval of test questions and

results, thanks to which the students in this research felt more confident to extend learning beyond class hours to review knowledge. Yet, they were not as likely to raise questions about things they were not clear about in class, probably due to time constraints. Students' cognitive engagement also benefits from the use of Quizizz-based formative tests, although they did not seem to be in such a high agreement level with the statements about how Quizizz tests help them improve critical thinking and monitor their own learning.

What particularly stands out from the findings is that students perceived the use of Quizizz to motivate them, and because of the formative assessment tasks delivered via this platform, they felt emotionally energized. From motivational perspectives, positive affective engagement smooths the way for more effective learning outcomes because of students' enhanced efforts and persistence in completing learning tasks [17]. This also potentially leads to better absorption of knowledge as Csikszentmihalyi's [2] flow theory pointed out. In addition, the qualitative data from the six interviews indicate that when participating in formative tests on Quizizz, these students set goals to complete the questions to the best of their knowledge, which extends to follow-up efforts in conducting further research to resolve unclear issues and review knowledge for final exams. These shared thoughts from the students suggest that Quizizz-based formative tests encouraged them to set goals in the learning process and to use strategies that help them achieve these goals. Students' persistence in digging deeper to understand the questions on Quizizz and come up with correct answers provides some evidence for their great mental expenditure and utilisation of deep strategies in learning [19]. The findings generally point to the potentials of Quizizz as a gamification platform to engage students, especially those at higher educational levels like the students in the current research, who can follow up the Quizizz-based formative tests with independent and self-regulatory learning strategies.

Learners' two reservations about the technical issues that prevented them from performing their best in the e-quizzes and stress resulting from the time pressure on Quizizz are worth teachers' attention. Current technological affordances on Quizizz and other similar gamification platforms allow the teachers to switch between different play modes. With some technical literacy, classroom teachers can easily address these concerns by selecting the most suitable adjustments to how the tests are delivered via Quizizz. For example, the countdown clocks can be turned off, timing can be adjusted depending on each test question, and students can be better familiarised with the gamification platforms prior to actual formative test administration. In addition, the students' recommendation that Quizizz should only be used for formative assessment tasks at the beginning or the end of lessons rather than for summative tests that contribute to final scores should be carefully considered. Finally, as with any other

digital applications in the classroom, teachers should consider who their learners are and what technical conditions are available in their teaching context. Understanding of the local situations can best inform the teachers' pedagogical decisions on when and how to conduct e-quizzes. If properly put to use, Quizizz is an effective tool to make lessons more cognitively, behaviourally, and emotionally engaging for students.

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