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GAMIFIED ASSESSMENT WITH QUIZIZZ: REDUCING TEST ANXIETY AND ENHANCING MOTIVATION IN INDONESIAN EFL CLASSROOMS THROUGH THE ARCS MODEL

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ABSTRACT

Aim/Purpose	This paper examines the effect of using Quizizz on students' learning motivation and test anxiety in an EFL classroom in Indonesia, employing Keller's ARCS model of motivation as the theoretical framework.
Background	Engaging students in the learning process can be challenging, particularly in the current environment where many students rely heavily on digital devices outside the classroom. Therefore, the education sector faces a new challenge and needs to adapt to new demands, modifying programs to better meet the needs of learners. Recently, interest has increased in researching learning approaches that can motivate students to learn, such as gamification.
Methodology	This study employed a quantitative approach, utilizing numerical values obtained from the survey to explain and clarify a particular phenomenon being observed – 62 EFL students who completed four learning sections incorporated with Quizizz as a gaming tool. After the final session, a questionnaire was distributed to all students to gauge their perspective on using Quizizz in the classroom. The data were analyzed using SEM-PLS with SmartPLS4 software.
Contribution	This study contributes to several aspects in the educational field, such as the theory testing of the ARCS model by Keller in EFL, the effect of gamified assessment by Quizizz on students' motivation and test anxiety, providing an in-

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	sight into gamified assessment usage for language learning, as well as recommendations for stakeholders to integrate gamification with their teaching and learning activities.
Findings	Two research questions and eight hypotheses were proposed to guide the direction of this study. The analysis showed that five out of eight hypotheses are supported. Confidence, relevance, and satisfaction were found to have a positive effect on students' motivation, while test anxiety was influenced by students' attention and confidence levels. Several factors may explain these findings, including students' digital literacy and specific features of Quizizz, as well as the application's competitive elements.
Recommendations for Practitioners	The findings suggest that teachers can effectively incorporate Quizizz as an assessment tool in their classrooms, as it enhances student motivation. While gamification can enhance motivation, it may not always reduce anxiety, particularly if competitive elements heighten stress. Therefore, educators need to design gamification strategies carefully to maximize motivation while minimizing test anxiety.
Recommendations for Researchers	Researchers in this area can focus on the qualitative approach to understanding external factors that may exist and affect their motivation and test anxiety. Instruments such as interviews can gain an in-depth understanding of students' perceptions that numerical data alone cannot explain.
Impact on Society	The study's outcomes suggest that through gamification, students can benefit from enhanced engagement and motivation, leading to improved academic performance. This study offers empirical, model-based evidence that can help policymakers, curriculum designers, and institutional leaders understand how to implement gamified digital tools, such as Quizizz, to enhance learning experiences.
Future Research	Future research should explore additional factors, such as self-regulation skills and coping mechanisms, and investigate familiarity to understand better how gamification interacts with students' emotional experiences in learning settings.

Keywords	SEM, Quizizz, ARCS, EFL, students' motivation, test anxiety

INTRODUCTION

One of the primary objectives of education is to encourage students to engage with and interact with the subject material (Anisa et al., 2020). However, engaging students in the learning process can be challenging, particularly in the current environment where many students rely heavily on digital devices outside the classroom (Baah et al., 2023). Therefore, the education sector faces a new challenge and needs to adapt to new demands, modifying programs to better meet the requirements, preferences, and orientations of current student cohorts (Göksün & Gürsoy, 2019). Additionally, teachers are expected to assume the roles of both pedagogical manager and educator, rather than merely serving as interpreters of educational content (Ignatyeva, 2015)

In response to these challenges, one emerging pedagogical strategy that has shown promise in addressing the issues is gamification. By incorporating game-like elements into the learning process, gamification aims to make educational activities more engaging and rewarding, thereby promoting higher levels of student participation (Qudsi, 2024; Su, 2016). Additionally, its playful and less formal nature may help alleviate students' language-related anxiety, particularly in assessment settings. This approach has gained attention not only for its potential to enhance motivation but also as a means of transforming the classroom into a dynamic and interactive learning environment.

Some studies have shown that the use of a gamification approach can yield significant advantages and benefits for students, primarily in terms of their motivation to learn (Baah et al., 2023; Göksün & Gürsoy, 2019; Zainuddin et al., 2020). However, there are still many challenges in implementing gamification (Baah et al., 2023). For example, there are limited studies on how gamification can be effectively implemented in assessment (Acosta-Medina et al., 2021; Göksün & Gürsoy, 2019). Additionally, from various indicators explored in previous studies on gamification, students' anxiety as part of assessment has been found to be limited (Wang & Tahir, 2020). Therefore, this study aims to explore the effect of gamified assessments on student motivation and test anxiety in EFL classrooms in Indonesia. Two research questions are:

RQ1: What is the role of gamified assessments (Quizizz) in motivating students to learn in the EFL classroom, based on Keller's ARCS model?

RQ2: What is the role of gamified assessments (Quizizz) in lessening students' test anxiety while doing the assessments, based on Keller's ARCS model?

ARCS MODEL OF MOTIVATION

The ARCS model of motivation, designed by John Keller, has key elements that address motivation collectively and effectively (Baah et al., 2023). Keller created it to identify and address issues related to learning motivation in a methodical manner and to establish a more comprehensive knowledge base around the primary factors influencing motivation to learn (Keller, 1987). The ARCS motivational model components consist of four categories: Attention (A), Relevance (R), Confidence (C), and Satisfaction (S). They are considered essential precursors for learning accomplishments (Putz & Treiblmaier, 2015). Each category outlines the conditions necessary to motivate an individual, and every category also comprises subcategories (Molaee & Dortaj, 2015).

Keller (1987) emphasized that if a student's interest is not piqued by instructional design, learning performance will not improve, which is why the ARCS model was chosen for this study. He proposed that teachers could use the ARCS model to create techniques that enhance both learning motivation and performance (Chang, 2021). Gamification aligns well with this model, as game-based courses and assessments are believed to stimulate student interest.

Additionally, Keller's model helps identify prerequisites for gamified systems (Baah et al., 2023) and highlights key factors in behavioral change and motivation (Gopalan et al., 2017). Tested across diverse cultural contexts, the ARCS model has proven to be a reliable tool for evaluating individual traits (Orji et al., 2019). Table 1 is a brief description of each ARCS category and its relation to a student's motivation, based on Keller (1987) and Chang (2021).

Table 1. The ARCS model of motivation for this study

Category	Definition	Variable	Goal
Attention	Attention is the first category of the ARCS model of motivation. Attention is the prerequisite for study and a key component of motivation. The significance is to direct the student's attention to the correct learning stimuli (Keller, 1987).	Learning attention	1. Verifying that the students are absorbed in the assessments while using Quizizz. 2. Track students' enthusiasm and interest while using Quizizz.

Category	Definition	Variable	Goal
Relevance	The relevance of a course for the students is that they know the correlation between the lesson content and their needs. Relevance is important to determine to what extent students feel satisfied with the content offered to meet their needs (Keller, 1987).	Learning interest	1. Use Quizizz as an assessment tool to instigate the students' interests. 2. Create fun assessments using Quizizz to keep them engaged and recognize their relevance.
Confi-dence	As a third component in Keller's motivation model, confidence plays a vital role in one's success. Confidence affects a student's persistence and achievements and develops positive attitudes to boost their self-esteem (Keller, 1987).	Learning behavior	1. Quizizz can be helpful for students and boost their confidence in doing the quizzes. 2. Quizizz can improve students' focus and confidence.
Satisfac-tion	The last category in Keller's model of motivation is satisfaction. Integrating study and practice supports students to feel good about their achievements. This satisfaction will be more effective without control from other people, including the teacher.	Learning satisfaction	1. By using Quizizz, with its gaming elements of leaderboards and levels, students will feel a sense of accomplishment when finishing the task, which can enhance their motivation.

LITERATURE REVIEW

GAMIFICATION IN LANGUAGE LEARNING

Gamification in language learning has been studied for years. When technology-assisted classrooms emerged, gamification attracted many researchers. Several studies about the use of gamification or gamified assessments in language learning have been influential (Martín-Sómer et al., 2021; Pitoyo et al., 2019; Rincón-Flores & Santos-Guevara, 2021).

Martín-Sómer et al. (2021) explore the use of Kahoot! in an online setting during the COVID-19 pandemic. Questionnaire and exam scores were used to gather the data from the students. Their study suggests that the use of Kahoot! can boost students' engagement in an online setting and can predict the exam result since those who got a higher score in Kahoot! games show to have a good mark in the final exam as well. A similar study was done by Rincón-Flores and Santos-Guevara (2021) when they implemented gamification in online learning during the COVID-19 pandemic in 2019. Reward-based system gamification was implemented by using badges each time students accomplish a certain task. The outcome showed that students are more engaged in online classes despite the sudden shift from traditional face-to-face classes.

While the study by Pitoyo et al. (2019) investigated students' test anxiety in gamified classrooms using Quizizz through questionnaires and interviews, it focused on measuring overall anxiety reduction based on survey mean scores. Unlike Pitoyo et al. (2019), who used descriptive statistics from surveys and interviews to assess anxiety reduction, this study adopts an SEM-PLS analytical framework. By modeling the structural relationships between gamified features, motivation (ARCS), and test anxiety, this study offers a more robust and theory-oriented investigation.

According to Deterding et al. (2011), gamification is a relatively young and rapidly expanding concept that involves incorporating game design aspects into non-gaming contexts. An instructional game has a different meaning from gamification. While the former refers to the creation of fully functional games for non-entertainment objectives, "gamified" applications only use game components. The trend of gamified education and learning has grown due to technological advancements that enable more digitalized learning environments. Moreover, their effective utilizations, such as the technical capabilities established in relation to video games, create immersive and engaging learning experiences (Majuri et al., 2018).

Although gamification is used globally, it is worth noting that cultural context influences how students respond to gamification (Jossan et al., 2021; Spathopoulou, 2019). By its nature, gamification encourages social interaction and teamwork among students, fostering a collaborative culture in which knowledge is shared more effectively and freely (Capatina et al., 2024). However, responses to these elements vary across cultural settings.

In Southeast Asia, which tends to be more of a collectivist culture, the environment tends to emphasize teacher authority, group harmony, and exam-oriented performance (Quyen & Chanh, 2025). These cultural characteristics may affect how students perceive competitive elements, time pressure, feedback styles, and collaborative features in gamified tools. However, most existing gamification studies are conducted in developed countries, such as those in Western educational settings (Duterte, 2024; Sambo et al., 2025), where learner autonomy and competition are emphasized (Jossan et al., 2021). This gap highlights the need to examine the application of gamification in Indonesian EFL classrooms.

This rapid growth of gamification in education has led to the development of numerous platforms and tools designed to integrate game mechanics into teaching and assessment practices. Among these, web-based applications have become particularly popular due to their accessibility, ease of integration into existing curricula, and ability to engage learners through interactive elements. One widely adopted example of such a tool is Quizizz.

Quizizz

Like other gamified web-based tools, Quizizz is a Web 2.0 platform where users can interact and contribute to the learning content (Göksün & Gürsoy, 2019). Quizizz is an online gamified quiz tool for assessment and revision that teachers and students can use for free (Alajaji & Alshwiah, 2021).

Quizizz provides students with an enjoyable way to assess their learning (Zainuddin et al., 2019). This tool is effective to utilize as part of a web-based assessment since the user interface is simple and easy to use. Also, it can be accessed through laptops, tablets, or smartphones, allowing flexibility and accessibility. To design an assessment in Quizizz, teachers need to create an account to share a custom quiz, or they can use the available quizzes provided in it. Besides the ease of use, it also provides conventional motivational elements of gaming that can engage students while playing, such as badges, instant feedback, points, leaderboards, avatars, and levels (Al-Rayes et al., 2022). Following Göksün and Gürsoy (2019), the features provided by Quizizz can be categorized as in Table 2.

Table 2. Design and features of Quizizz

Criteria	Quizizz
The way the questions are presented	Both quiz questions and multiple-choice questions are displayed individually on the students' devices one after another.
Advancement	Each student can move on to the following questions once they have answered the previous question or once the time is up for that question.
Feedback	Once the student answers a question, positive or negative messages are displayed immediately following the response, depending on whether the student provided the correct or incorrect answer.

Criteria	Quizizz
Technical prerequisites	Any device, such as smartphones, laptops, or tablets, along with an internet connection, is required for students and teachers to initiate the quiz.
Length of questions	Teachers can create as many questions and answers as they wish since there is no limitation on the characters for the queries.
Formulation of questions and options	There is no set number of multiple-choice answers. Audio and visuals can be included in the questions. A preview is accessible while creating the quiz.

Students' Motivation in Language Learning

Motivation is derived from the Latin word "movere" and can be translated as "to move" (Mannell, 2014). The term "motivation" in the context of foreign language learning (FLL) refers to the "primary push to commence the FLL, and subsequently, the driving force to sustain the long, sometimes painful learning process" (Welesilassie & Nikolov, 2022, p. 2). Motivation is a crucial factor in studying a foreign language, particularly English (Ekiz & Kulmetov, 2016). Without adequate motivation, students will struggle to achieve their long-term goals, even with good teaching and strong linguistic aptitude (Dörnyei & Ryan, 2015). Moreover, it is widely acknowledged that motivation can improve effectiveness and affect language learners' success (Tashlanovna et al., 2020).

English has become an important language to study today due to its increasing role as a lingua franca and international language (Rahman et al., 2017). In Indonesia, it is considered the first foreign language among many (Smith, 1991). Despite its prominence, many students have considerable problems learning a second language (L2), particularly English (Alshenqeeti, 2018). Because of these challenges, fostering students' motivation is essential, as motivation plays a critical role in studying a foreign language (Ekiz & Kulmetov, 2016).

Thus, a lack of motivation could impact students' achievement in mastering a foreign language significantly, even if they are highly capable (Dörnyei, 1998). By contrast, students with sufficient motivation are likely to get better results in acquiring a second language. Some research around motivation has already been conducted, and it considers what factors might influence students' motivation toward language learning. Motivation can be divided into extrinsic and intrinsic motivation when it comes to learning (Triyanto, 2019). Engaging in an activity for oneself and the pleasure and fulfillment that result from it are both considered forms of intrinsic motivation for students.

Understanding motivation in language learning is important, but it cannot be viewed in isolation. While motivation plays a crucial role in driving student engagement and achievement, it often interacts with other psychological factors that influence performance. One such factor is test anxiety, which can undermine even highly motivated students during assessments.

Test Anxiety and Gamified Assessment

Around 25-40% of students experience test anxiety during quizzes, assessments, or exams, which negatively affects academic performance (Bonefont et al., 2022; Cassady, 2010; Hancock, 2001; Khalaila, 2015). Empirical data show a strong correlation between general anxiety, test anxiety, and student motivation (Balogun et al., 2017; Urhahne et al., 2011). Over the past 50 years, researchers have conceptualized test anxiety as a personality trait that triggers physiological, behavioral, and psychological responses in stressful situations (Hancock, 2001; Tan & Pang, 2023). Bonefont et al. (2022) have described it as a collection of reactions linked to fear of failure during assessment. Bonefont et al. (2022) studied the use of game-based assessments with an engineering-based self-learning computer-based environment called GSLEES in a Biofluid Mechanics class. The study found that students had a positive attitude toward the gamified assessments, feeling more relaxed and confident, with reduced anxiety and nervousness during quizzes.

Educational technologies have enhanced student motivation and positive attitudes toward English language learning (Afshari et al., 2013; Li et al., 2019). Various studies have recommended the use of computer-assisted (CALL) and mobile-assisted language learning (MALL) to improve student engagement (Alamer et al., 2023). However, challenges remain in implementing gamification for learning, particularly in assessment (Acosta-Medina et al., 2021; Baah et al., 2023). Research on gamification's effect on student anxiety is also limited (Wang & Tahir, 2020).

To address the gap in previous research, this paper explores the use of Quizizz and its effects on EFL students' motivation and test anxiety in Indonesia. For this study, eight hypotheses were constructed as follows (Figure 1):

- **H1**. The use of Quizizz draws the attention of the students to the task given, motivating them to do the task.
- **H2**. The use of Quizizz draws the attention of the students to the task given, lessening their test anxiety about doing the task.
- **H3**. By using Quizizz, relevant tasks are generated that affect students' motivation.
- **H4**. By using Quizizz, relevant tasks are generated that affect students' test anxiety.
- **H5**. By using Quizizz, the level of confidence of students influences their motivation.
- **H6**. By using Quizizz, the level of confidence of students influences their test anxiety.
- **H7**. By using Quizizz, the satisfaction gained influences students' motivation.
- **H8**. By using Quizizz, the satisfaction gained influences students' test anxiety.

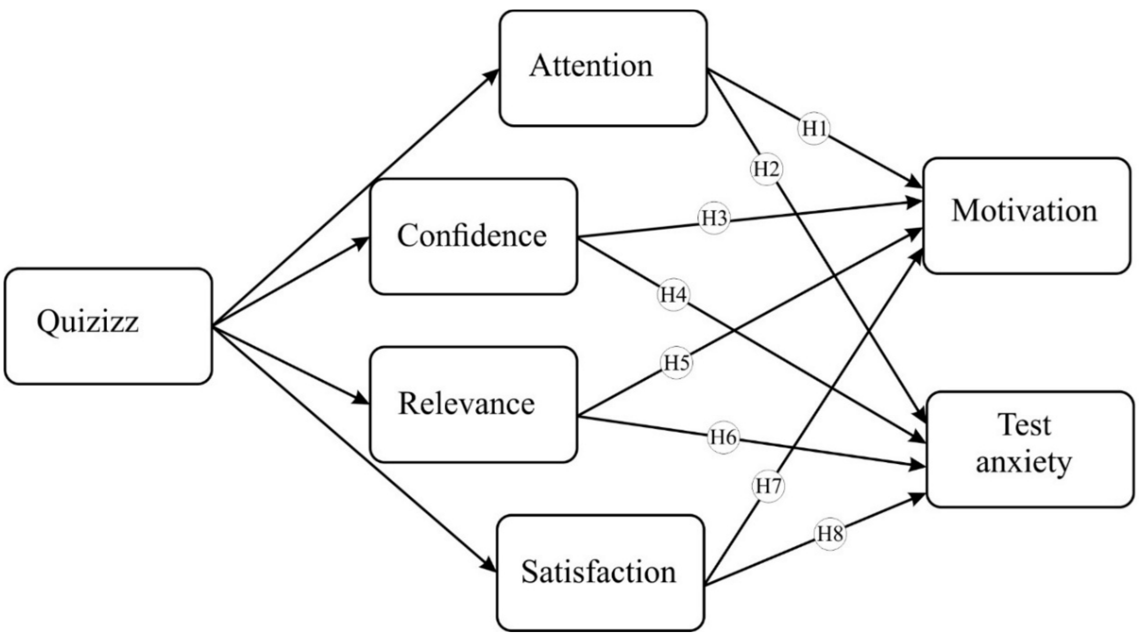

Figure 1. The hypothesis structural model for the relationship between the indicators and the studied variables influenced by Quizizz

METHODOLOGY

RESEARCH APPROACH

This study employed a quantitative approach, where the numerical values obtained from the survey were used to explain and clarify a particular phenomenon being observed (Taherdoost, 2022). Additionally, it involved testing objective theories by analysing the relationships between variables (Creswell & Creswell, 2018). One possible benefit of employing a quantitative technique is that the data may be less biased, enabling the researcher to independently confirm that the participants match the study's requirements without disclosing additional personal information (Baah et al., 2023).

PARTICIPANTS

A purposive sampling technique was employed in this study, and the participants were selected based on their specific characteristics and the needs of the study. The participants were university-level students enrolled in the English course at Universitas Muhammadiyah Kotabumi (UMKO) in Indonesia during the 2023-2024 academic year. The class consisted of 62 students, comprising 19 males and 43 females, with ages ranging from 17 to 19 years old (Table 3). They were selected because they were students in the English department and had experience with the gamification tools for their learning, especially Quizizz.

Table 3. The demographic profiles of the participants

Demographic variables	Categories	Numbers	Percentages
Gender	Male	19	30.6%
	Female	43	69.4%
Age	17	14	22.7%
	18	42	68.2%

DATA COLLECTION AND ANALYSIS

A questionnaire was used to gather quantitative data from the respondents, through which this study investigated and assessed students' motivation and test anxiety in EFL classrooms. The questionnaire was modified from Baah et al. (2023) and Chang (2021) for the Attention, Relevance, Confidence, and Satisfaction (ARCS) model of motivation and Pintrich and De Groot (1990) for test anxiety. Initially, 17 items were distributed to the respondents in the questionnaire. However, after the validity test, two questionnaire items were eliminated because they did not exceed the minimum outer loading value (0.708).

This questionnaire consisted of a 5-point Likert-type scale assessing participants' degree of agreement as follows: strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), and strongly disagree (1). Structural equation modeling (SEM) was employed to analyze the raw data due to its effectiveness in exploring multiple variables in language learning research (Hair & Alamer, 2022). The partial least squares (PLS) method was applied to assess the SEM model, as it is considered a fully formed approach (Hair et al., 2019), widely used, and better suited for L2 studies (Chang, 2021; Hair & Alamer, 2022). SmartPLS 4 software was used to analyze and interpret the collected data. SmartPLS 4 allows users to evaluate the validity (convergent and discriminant) and reliability directly in the software, eliminating the need to manually calculate them, while PLS-SEM excels at examining crucial relationships between constructs (Hair et al., 2014). Moreover, SmartPLS software is suitable for calculating small sample sizes (Alamer et al., 2023). Hair and Alamer (2022) suggested that analysing the SEM model involves several key steps.

In relation to the inner (structural) model, it begins by defining the sequence in which the model's constructs were applied. This defined motivation (MO) and test anxiety (TA) as the endogenous variables that would be influenced by the following exogenous variables: attention (AT), relevance (RE), confidence (CO), and satisfaction (SA).

PLS-SEM (inner and outer measurement)

Outer assessment: For outer measurements, Hair and Alamer (2022) have recommended evaluating several aspects of the model, including checking the loading factor, internal reliability (Cronbach's alpha and composite reliability), average variance extracted (AVE), and discriminant validity, using the HTMT criterion. They suggest a loading factor value of 0.708 to achieve at least 50% of the variance explained (Donkor et al., 2021). The discriminant validity was determined by the HTMT ratio (>0.85 or 0.90) and the Fornell-Larcker criterion.

Inner model assessment: After verifying the validity and reliability of the constructs, the structural model was assessed to evaluate the predicted outcomes. This involved checking for multicollinearity using the variance inflation factor (VIF), with a threshold of below 3.0 (Hair & Alamer, 2022), analyzing the size and significance of the path coefficients, and assessing the coefficient of determination (R^2). R^2 values, ranging from 0 to 0.10, 0.11 to 0.30, 0.31 to 0.50, and greater than 0.50, indicate weak, modest, moderate, and strong relationships, respectively (Hair & Alamer, 2022). Additionally, the f^2 effect size follows Cohen's (1988) rule of thumb, where values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively.

Research Procedure

The study was conducted in four English classes on various topics at Universitas Muhammadiyah Kotabumi (UMKO). All the classes were online via Zoom. The Quizizz games were employed in the final moments of each session when a new subject was covered. Once the fourth class had finished, the questionnaire was distributed to the students to collect data on their perception of using Quizizz games in their EFL classes.

The study was conducted four times with students in the English department at Universitas Muhammadiyah Kotabumi (UMKO), Lampung. All the classes were held via Zoom meetings after the approval from the university faculty, and each session lasted for approximately 40 to 50 minutes, including the Quizziz session at the end of each session. The content for each class focuses on key language learning topics that align with the curriculum and syllabus given by the assigned teacher.

- **Session 1:** Giving and asking for directions in English, including key vocabulary related to places and prepositions of place and movement
- **Session 2:** Simple past tense in narrative writing, as well as reading comprehension, and main idea identification
- **Session 3:** Discussing hobbies and free-time activities, focusing on expressions of likes and dislikes
- **Session 4:** Talking about different jobs and occupations, including job-related vocabulary and a job interview

At the end of each session, a gamified assessment was given using the Quizizz platform. To access the quiz, students needed to open their Quizizz web or app on their phone and input the special code provided by the instructor so that they could log in to the quiz interface. Once all students were logged in to the quiz interface, the quiz was started. The students could see the questions and answers on their screens, and they could answer them as fast as they could to get more points and then move to the next question. The leaderboard was displayed on the instructor's screen, which was shared with the whole class, so they could check their own and their peers' positions in the leaderboard in real time. Each quiz given for each session consisted of 20 multiple-choice questions, incorporating game features such as time pressure, scoring, leaderboards, an avatar, and feedback. The quizzes served both as formative assessment and engagement tools, helping to reinforce learning while reducing students' anxiety by presenting the evaluation in a low-stress and playful format.

In this study, gamification was introduced through the use of the Quizizz platform, which allowed for the integration of game-like features into the assessment process. The design followed the ARCS motivational model, aiming to capture students' attention, ensure content relevance, build confidence through supportive feedback, and foster satisfaction via positive reinforcement and rewards.

RESULTS

ASSESSMENT OF THE MEASUREMENT MODEL (OUTER ASSESSMENT)

This assessment involves verifying the reliability, convergent validity, and discriminant validity of the constructs, as suggested by Hair and Alamer (2022). To evaluate the reliability of the constructs and verify convergent validity, the outer loading, Cronbach's alpha, composite reliability, and AVE were examined (Appendix A, Table A1). Then, for discriminant validity, the HTMT ratio and the Fornell-Larcker criterion are used (Appendix A, Table A2). From the analysis, it can be concluded that the data collected from the questionnaire demonstrates a good index of reliability and validity, as all values from the structural model fall below or above the recommended cut-off points.

EVALUATING THE STRUCTURAL EQUATION MODEL (INNER ASSESSMENT)

The R^2 values indicate the proportion of each outcome that the model can explain. For this model, the R^2 values are varied for each variable, where motivation has a value of 0.722 and test anxiety has a value of 0.266 (Appendix B, Table B2). This indicates that it has a moderate to strong effect size. According to Hair and Alamer (2022), the R^2 is considered strong when the value is greater than or equal to 0.50, has a moderate range between 0.30 and 0.50, is modest at 0.11-0.30, and is weak between 0 and 0.10. Therefore, the model construct demonstrates strong predictive power for motivation, explaining approximately 72% of the variance. In contrast, test anxiety accounts for approximately 27% of its variance, which is considered a modest level of explanatory power. Figure 2 illustrates the final model, including outer loading, path coefficients, and R^2 values of the endogenous constructs of the model.

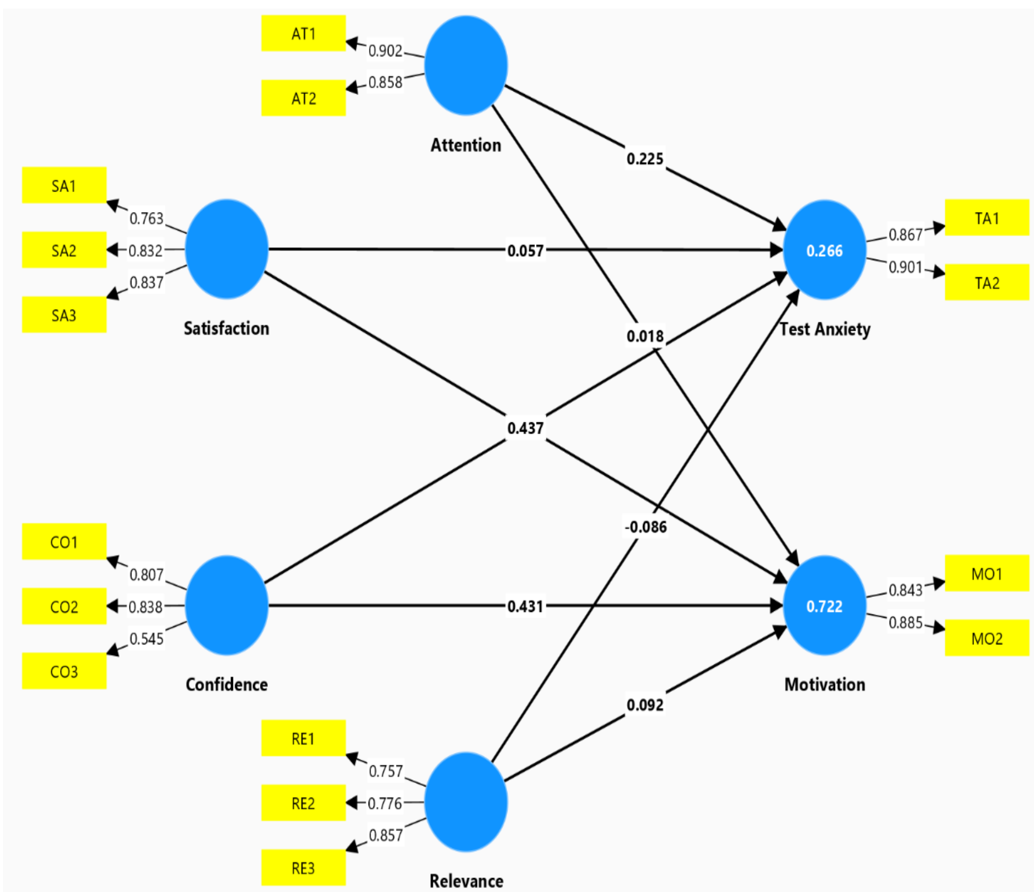

Figure 2. The structural model results

Assessment of Structural Modeling of Path Coefficient

The mediational effects were examined through a calculation using bootstrapping sub-samples, allowing for an investigation into the hypotheses provided for this study. Table 4 presents the results of the evaluation of the structural model. Notably, the VIF of each indicator ranged from 1.132 to 1.827, which is below the recommended cut-off value of 3.0 (Hair & Alamer, 2022). This means that there was no multicollinearity among the indicators. The result of the f^2 effect size shows that the significance of each indicator ranged from small to nearly large, referring to the f^2 rule of thumb that 0.02, 0.15, and 0.35 indicate small, medium, and large, respectively (Cohen, 1988) (see Appendix B, Table B1 for complete measurement statistic).

Table 4. Path coefficients result for hypotheses

Hyphotheses	Path	Path coefficient (β)	P values	Result	Vif	F2
H1	AT> MO	-0.067	0.259	Unsupported	1.558	0.008
H2	AT > TA	0.222	0.049 *	Supported	1.558	0.014
H3	CO > MO	0.319	0.002*	Supported	1.827	0.148
H4	CO > TA	0.353	0.030*	Supported	1.827	0.089
H5	RE > MO	0.226	0.001*	Supported	1.132	0.120
H6	RE > TA	-0.020	0.446	Unsupported	1.132	0.000
H7	SA > MO	0.488	0.000*	Supported	1.775	0.356
H8	SA > TA	-0.027	0.442	Unsupported	1.775	0.001

*p<0.05 (one-tailed), N = 62

Discussion

The research questions were developed to examine how the four components of Keller's ARCS model affect students' motivation and test anxiety when using Quizizz. RQ1 focuses on the factors that contribute to students' motivation in the EFL classroom. Accordingly, four hypotheses were formulated to test the effects of attention (H1), relevance (H3), confidence (H5), and satisfaction (H7) on students' motivation. RQ2 examines the role of gamified assessments in reducing students' test anxiety. This led to four additional hypotheses, which evaluate how attention (H2), relevance (H4), confidence (H6), and satisfaction (H8) influence students' test anxiety. Together, these hypotheses allow for a comprehensive evaluation of how different motivational components within a gamified assessment environment shape students' learning experiences.

The Effect of Gamification on Motivation

The findings of this study suggest that gamification can influence students' motivation, mainly through confidence, relevance, and satisfaction, as shown in Table 4. For motivation, attention is the only indicator that is not significant. One possible reason for this might be that during the online class session, some students admit to having problems with their connection, especially those who live in rural areas with limited access to reliable digital infrastructure. Technical issues, such as slow internet connections, can heavily impede students' attention (Hossen & Uddin, 2023), resulting in their task performances (Akmad & Abatayo, 2024).

While the game-based features in Quizizz may be enough to capture and maintain students' attention, allowing them to focus on the assessment, the connection disruption might have interfered with their ability to focus consistently. Additionally, the extended duration of online sessions may have contributed to cognitive fatigue, making it more difficult for learners to sustain attention over time

(Akmad & Abatayo, 2024). The students might feel tired during the session since the Zoom meeting was conducted at night, and they have their normal classes at the university during the day.

Confidence was found to have a significant effect on motivation, aligning with previous research indicating that self-efficacy plays a crucial role in student engagement (Ozdamli, 2018). In the current global context, where students always carry a computer with them (Koivisto & Hamari, 2014), this causes them to be more digitally literate than generations before. This digital literacy enhances their confidence, as students who are familiar with technology-assisted learning environments are more likely to feel competent and motivated (Hidayat et al., 2022). Consequently, they are more capable of learning with digital devices, which is essential in a technology-assisted learning environment (Lee & Hidayat, 2019).

Moreover, relevance contributes to motivation by ensuring that students see value in the learning content, although it only has a small effect size ($f^2 = 0.120$). This indicates that while relevance plays a role in influencing motivation, its overall effect on the variance of student motivation is relatively modest. However, even a small effect can be meaningful in educational settings, especially when combined with other factors. When students perceive tasks as meaningful, their engagement increases, supporting the argument that relevance enhances intrinsic motivation (Phung, 2017; Skarpaas, 2024). One of the key reasons that Quizizz enhances motivation is its ability to provide instant feedback and adaptive questioning, ensuring that students are constantly engaged with tasks that are appropriately challenging. Furthermore, relevant and well-designed tasks can satisfy learners' competence needs and further increase their motivation to participate (Deci & Ryan, 1985).

In addition, looking at the nature of Quizizz itself, in which students compete with others in the classroom, gives relevance to an additional dimension. The avatar, as well as the competitive aspect of Quizizz, fosters a dynamic and interactive environment where students not only focus on their own progress but are also aware of their peers' performance through the leaderboard.

Among all factors examined, satisfaction exhibited the strongest influence on motivation, showing a path coefficient of ($\beta = 0.488$) and effect size of ($f^2 = 0.356$), reinforcing the idea that enjoyable and well-designed gamified learning experiences foster sustained student engagement (Koivisto & Hamari, 2014; Lee & Hidayat, 2019). One of the possible reasons for this is that game features such as leaderboards, feedback, and badges are elements that influence students' satisfaction (Sailer et al., 2017), which later affect their motivation (Mazarakis & Braüer, 2023). These elements provide feedback on students' performance, either immediately (like points or graphs) or cumulatively (like badges or ranks on leaderboards). This feedback then allows players to evaluate their success, see progress, and feel effective, which satisfies the need for competence (feeling capable and achieving mastery).

THE RELATIONSHIP BETWEEN GAMIFICATION AND TEST ANXIETY

Attention and confidence are the two indicators that affected the students' test anxiety, according to this study's findings. Although some students admit that connection problems existed during the test, which might affect their attention and motivation, this may not be the case for their anxiety. Although the attention was disrupted, it was still enough to make the student focus on the test. Furthermore, considering that the Quizizz assessment was administered during the evaluation session immediately after the classes concluded, the students were still familiar with the material. Therefore, it gave them additional support to help them focus more on their quiz and lessen their anxiety ultimately.

Confidence played a crucial role in reducing test anxiety, supporting the notion that self-efficacy mitigates stress and fear of failure (Bonefont et al., 2022). When students feel capable of handling assessments, their anxiety is lower, as demonstrated in studies emphasizing the role of self-confidence in reducing academic stress (Ozdamli, 2018). This makes more sense since the assessment was taken directly after the class had just finished, so that the student still remembered clearly what was being taught.

However, satisfaction and relevance did not have a significant effect on test anxiety. This suggests that while students may enjoy gamified learning environments, the core psychological factors driving test anxiety, such as fear of negative evaluation and performance pressure, are not easily alleviated through engagement alone (Hancock, 2001; Wang & Tahir, 2020).

While Quizizz offers an engaging, interactive platform for assessment, certain features may be less effective or even counterproductive in other cultural or educational contexts. For example, in collectivist cultures, overt competition and public ranking may conflict with norms that emphasize group harmony, potentially increasing anxiety rather than reducing it (Hofstede, 2011). Similarly, in educational systems where rote learning and formal examinations dominate, the informal, game-like nature of Quizizz may be viewed as incompatible with traditional pedagogical expectations. Furthermore, technical requirements such as stable internet access and device availability may limit its applicability in under-resourced regions.

While previous studies had examined motivation in second language acquisition (Dörnyei, 1998; Triyanto, 2019) and the detrimental effects of test anxiety on academic performance (Bonefont et al., 2022; Cassady, 2010; Khalaila, 2015), few studies have explored the intersection of these factors in the context of gamified assessment. Existing work on gamification in education often focuses on engagement or achievement outcomes (Dichev & Dicheva, 2017), yet it rarely investigates its role in mitigating anxiety during evaluation sessions. Moreover, much of the literature addresses long-term motivation or general testing environments, overlooking immediate post-instruction assessments where students' familiarity with the material may interact with their emotional state.

The present study not only addresses these gaps but also contributes to theory testing by applying and examining the ARCS model of motivation (Keller, 1987) in a gamified evaluation setting. By linking gamification effects with established motivational theory, the findings offer novel insights into how game-based assessment can sustain attention, enhance confidence, and reduce anxiety, particularly when administered immediately after instruction, when material mastery is still fresh in students' minds.

IMPLICATIONS FOR GAMIFIED LEARNING ENVIRONMENTS

The results of this study have several implications for future research, the practice of EFL classrooms, and theoretical testing. As this study focused more on the practical impact of gamification, especially Quizizz, future studies can explore in more depth the theoretical reasons why only two indicators affected the students' test anxiety. Additionally, it can explore other factors, such as self-regulation skills and coping mechanisms, and assess familiarity to better understand how gamification interacts with students' emotional experiences in learning settings. Additionally, teachers' roles could be explored, and the most effective strategies for implementing gamification in EFL classrooms could be focused on.

In addition, this study has several practical implications for teachers, institutions, and policymakers. The findings suggest that teachers can incorporate Quizizz as an assessment tool in their classrooms because it can enhance their motivation through their confidence, relevance, and satisfaction. Notably, satisfaction has the highest effect, which is important to their overall learning outcome. By incorporating game-based elements such as real-time feedback, competition, and rewards, educators can create a more engaging and supportive learning environment that can improve learning retention. Additionally, while gamification can enhance motivation, it may not always reduce anxiety, particularly if competitive elements heighten stress. Therefore, educators need to design gamification strategies carefully to maximize motivation while minimizing test anxiety.

Although the findings show a positive effect of gamification, without a proper application and infrastructure, the implementation could fall short. Therefore, institutions can support by providing a good infrastructure, such as a stable internet connection, device availability, and training for teachers on how to design and implement Quizizz activities effectively.

At the policy level, policymakers can consider developing guidelines that encourage the use of gamified tools for formative assessment. Particularly, in EFL classrooms in Indonesia, where Indonesia is considered to have a low English proficiency index (Education First, 2025). Policies that promote teachers' digital literacy and provide funding for educational technologies would help ensure equal implementations for all stakeholders. This study further benefited from the testing of the ARCS model in relation to gamification for EFL learners.

LIMITATIONS OF THE STUDY

There are several limitations of this study. First, the study was limited to a single university and one particular group of students. Although purposive sampling is appropriate for selecting participants with direct experience in gamified EFL learning, it has some limitations. Those limitations include reduced statistical generalizability, potential selection bias, and reliance on the researcher's subjective judgment, which may affect the representativeness of the sample. As the participants were drawn from a specific EFL classroom, the results should be interpreted with caution beyond the study context.

Second, this study employed a quantitative methodology, gathering empirical data through questionnaires. Therefore, it would be beneficial for future studies to adopt a mixed-methods approach, incorporating additional research instruments such as focus group discussions (FGDs), in-depth interviews, and pre- and post-tests, to gain a deeper understanding of how students perceive the use of Quizizz in EFL classes.

CONCLUSIONS

The study aimed to investigate the motivation and test anxiety of EFL students in Indonesia following the implementation of Quizizz in their English classes. Keller's ARCS model of motivation was used in this study, as it has proven to be a stable and well-established scale for examining students' motivation. Additionally, this model has been extensively tested across various applications and cultural contexts worldwide, demonstrating its reliability (Orji et al., 2019). This is an exploratory quantitative study in which the data were collected using a questionnaire with a five-point Likert scale.

The empirical data show that relevance, confidence, and satisfaction affect the student's motivation, while only confidence and attention affect the student's test anxiety. Contrary to this study's expectations, the feeling of relevance and satisfaction in using Quizizz does not significantly affect students' anxiety. However, the results of the structural equation model (SEM) revealed that the four indicators in the Keller model (attention, relevance, confidence, and satisfaction) could explain the modest size of variance in test anxiety (26.6%) and a robust variance in motivation (72.2%).

Although this study is situated in the Indonesian EFL context, the findings may be relevant to other educational settings with similar characteristics, particularly in non-Western contexts. Other collectivist cultures, such as those in Southeast Asia, where group harmony, teacher authority, and exam-oriented practices are emphasized, may also have high relevance. However, the effect of gamification may vary depending on cultural values, institutional support, and the availability of digital infrastructure. Thus, educators and policymakers in different contexts should adapt gamified assessment strategies to align with local educational needs and learner characteristics.

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APPENDICES

APPENDIX A. ASSESSMENT OF THE MEASUREMENT MODEL (OUTER ASSESSMENT)

Table A1. The result of the model construct (outer loading, reliability, and convergent validity)

Construct	Outer loading	Cronbach's alpha (∝)	Composite reliability	Ave
Attention (AT)		0.712	0.874	0.776
I can immerse myself in the Quizizz assessment for learning English (AT1)	0.884			
The variety of reading passages, exercises, illustrations, etc., in Quizizz helped keep my attention on the user instructions (AT2)	0.878			
Relevance (RE)		0.817	0.890	0.731
It is clear that the Quizizz contents are related to things I already know (RE1)	0.833			
The contents of the Quizizz convey the impression that being able to use the gamified test is worth it (RE2)	0.814			
I think that doing the assessment using Quizizz is interesting for learning English (RE3)	0.914			
Confidence (CO)		0.790	0.877	0.705
As I did the gamified assessments, I was confident that I could perform well (CO1)	0.803			
After studying, I was confident that I would complete the exercises given in the gamified 'assessments (CO2)	0.898			
The good organization of the content in the gamified test helped me to be confident that I would do well (CO3)	0.815			
Satisfaction (SA)		0.740	0.852	0.658
I enjoyed the gamified assessment or test so much that I was stimulated to keep interacting with it (SA1)	0.766			
It was a pleasure being part of the gamified assessment (SA2)	0.826			
Completing the activities in the gamified test gave me a satisfying feeling of accomplishment (SA3)	0.840			
Test Anxiety (TA)		0.802	0.910	0.834
Doing the gamified test or assessments makes me less nervous than the traditional test (TA1)	0.902			
I do not think of how poorly I am while doing the gamified 'assessments or tests (TA2)	0.925			

Construct	Outer loading	Cronbach's alpha (α)	Composite reliability	Ave
Motivation (MO)		0.876	0.942	0.890
The fun generated from the gamified assessments motivated me to study (MO1)	0.942			
The activities in the gamified assessments motivated me to study (MO2)	0.945			

Table A2. Discriminant validity based on the Fornell-Larcker criterion and the HTMT ratio

	AT	CO	MO	RE	SA	TA
Fornell-Larcker criterion						
AT	**0.881**					
CO	0.534	**0.840**				
MO	0.424	0.650	**0.943**			
RE	0.302	0.282	0.426	**0.855**		
SA	0.517	0.621	0.712	0.267	**0.811**	
TA	0.390	0.449	0.370	0.139	0.301	**0.913**
Heterotrait-Monotrait ratio						
AT						
CO	0.712					
MO	0.536	0.779				
RE	0.402	0.367	0.496			
SA	0.707	0.802	0.883	0.340		
TA	0.512	0.560	0.439	0.185	0.382	

Appendix B. Evaluating Structural Equation Model (Inner Assessment)

Table B1. Path coefficients result for hypotheses

Hyphotheses	Path	T statistic	95% CI	
			Low	High
H1	AT> MO	0.647	-0.234	0.107
H2	AT > TA	1.656	0.031	0.472
H3	CO > MO	2.853	0.138	0.503
H4	CO > TA	1.877	0.058	0.681
H5	RE > MO	3.049	0.113	0.351
H6	RE > TA	0.136	-0.290	0.197
H7	SA > MO	4.506	0.298	0.648
H8	SA > TA	0.147	-0.351	0.252

Table B2. Coefficient of determination (R^2) values

Indicators	R^2
Motivation	72.2%
Test anxiety	26.6%

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