

Fostering L2 Grit in Online Gamified Language Learning: The Role of Self-Efficacy, Critical Thinking, Learning Satisfaction and Gamification in Indonesian EAP Courses

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Abstract

In an era where digital learning tools are reshaping educational landscapes, understanding the factors that contribute to students' perseverance in language learning is crucial. This research explores the interplay between factors driving L2 grit in gamified language learning contexts in online English for Academic Purposes (EAP) courses in Indonesia. The factors include academic self-efficacy, critical thinking, learning satisfaction, perceived ease of use (PEoU) and perceived usefulness (PU) of gamification. Using a survey-based quantitative approach, the data were collected from 300 EFL undergraduate students enrolled in online EAP classes at a public university in Central Java, Indonesia. The data were then analyzed by using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The findings revealed that PEoU positively influences academic self-efficacy, critical thinking, and learning satisfaction. PU similarly enhances these constructs. Notably, academic self-efficacy emerged as the strongest predictor of L2 grit, with critical thinking and learning satisfaction also having positive significant contribution. These results highlight the impact of gamification as a pedagogical strategy for fostering persistence and resilience in EFL learning.

Keywords: Academic self-efficacy, critical thinking, English for academic purposes (EAP), gamification, learning satisfaction, L2 grit.

Maintaining persistence in second language (L2) English learning remains a complex challenge, as learners often struggle to sustain consistent effort over time to achieve proficiency. Empirical research highlights L2 grit as a critical factor influencing students' long-

term engagement and overall language performance, demonstrating its role in fostering sustained language acquisition (Solhi et al., 2023). However, it is important to distinguish between grit and engagement, as they represent related but distinct constructs. L2 grit, defined as the combination of perseverance and passion for achieving long-term language learning goals (Teimouri et al., 2022; Wei et al., 2020) is derived from the broader psychological construct of grit but tailored to the context of second language acquisition (Alamer, 2021). This trait enables learners to navigate the challenges of language learning by maintaining motivation, developing positive coping strategies, and counteracting negative emotions such as boredom and burnout. In contrast, engagement in L2 learning refers to learners' active, moment-to-moment involvement in learning tasks. It encompasses behavioral, emotional, and cognitive dimensions and reflects present-focused participation such as attention, curiosity, and enthusiasm during lessons or activities. Unlike grit, engagement is dynamic and context-dependent, influenced by factors like task design, classroom environment, and instructional methods.

Importantly, L2 grit can contribute to an upward motivational cycle in which sustained engagement and enjoyment reinforce perseverance, leading to deeper and more meaningful practice (Shirvan et al., 2021). While prior research has examined the interplay between gamification and engagement (Puig et al., 2023), and between emotional resilience and language learning outcomes (Pawlak et al., 2022), further investigation is needed to identify the factors that promote the development of L2 grit, particularly in gamified learning environments where motivational processes may differ from traditional settings.

The integration of gamification into online English for Academic Purposes (EAP) courses has gained increasing attention in recent years, particularly in contexts where technology plays a central role in education (Ali & AbdAlgane, 2022; Dehghanzadeh et al., 2021; Doğan, 2023). Gamification refers to the use of game design elements—such as points, levels, badges, leaderboards, challenges, and instant feedback—in non-game contexts to increase user engagement, motivation, and participation (Kapp, 2012). In Indonesia, the rapid expansion of digital learning platforms has led to widespread adoption of gamified tools, such as Quizizz, Kahoot!, Duolingo, and other interactive learning systems, in university-level EAP instruction (Aini et al., 2024; Devitriana & Wijirahayu, 2025; Mohzana, 2023; Wibowo et al., 2025). These tools leverage game-like elements such as points, leaderboards, badges, challenges, and instant feedback to enhance engagement, motivation, and learning outcomes. Gamification in language learning is particularly effective in fostering intrinsic motivation, which is essential for developing L2 grit, as students perceive the learning experience as enjoyable and rewarding rather than purely task-driven (Wulantari et al., 2023).

Moreover, prior research indicates that gamification is highly effective not only in traditional face-to-face language learning but also in online learning environments (Liu et al., 2024; Shen et al., 2024; Zhao & McClure, 2024). Online EAP courses are designed to develop learners' English language proficiency for academic success, encompassing skills such as academic reading, writing, critical thinking, and research-based communication. Due to the complexity of these skills, sustaining learner engagement and perseverance in an online environment remains a considerable challenge (Paradowski & Jelińska, 2024). Unlike traditional face-to-face instruction, online EAP courses demand higher levels of learner autonomy, self-regulation, and sustained motivation. In this context, gamification can serve as an effective solution by offering interactive, engaging, and structured learning experiences that motivate learners to overcome challenges, set long-term academic goals, and remain actively involved with course content (Zhang, 2025; Zhou, 2024).

Despite the potential benefits of gamification to promote L2 grit in online EAP settings, its effectiveness depends on learners' perceptions of its ease of use and usefulness, two key psychological constructs that determine their engagement with gamified systems (Luo, 2023; Panagiotarou et al., 2020; Zainuddin, 2024). Perceived ease of use (PEoU) refers to the extent to which learners find gamification intuitive and effortless to use (Al-Gethami & Al-Sowat, 2024), while perceived usefulness (PU) reflects their belief that gamification enhances their academic learning outcomes (Bancoro, 2024). If students perceive gamified tools as accessible and beneficial for developing academic English skills, they are more likely to persist in their learning efforts, reinforcing L2 grit. Conversely, if they find these tools cumbersome or irrelevant, their motivation may diminish, leading to lower engagement and persistence.

Furthermore, within gamified EAP learning environments, several factors may interact to shape learners' L2 grit, such as academic self-efficacy, critical thinking, and learning satisfaction. Academic self-efficacy refers to students' belief in their ability to succeed in academic tasks, which is a crucial determinant of perseverance and engagement in language learning (Cong et al., 2024). Learners with high self-efficacy are more likely to embrace challenges, maintain effort in the face of setbacks, and remain committed to long-term learning goals (Adams et al., 2020; Hayat et al., 2020; Zysberg & Schwabsky, 2021). Critical thinking, defined as the ability to analyze, evaluate, and synthesize information, enhances learners' capacity to engage deeply with academic texts, develop well-structured arguments, and persist through complex linguistic challenges (Lu & Xie, 2024). When students apply critical thinking skills, they are more likely to approach learning strategically and persistently, thereby reinforcing L2 grit (Li & Liu, 2021; Lu & Xie, 2024; Wale & Bishaw, 2020).

Learning satisfaction reflects students' overall perceptions of their learning experience, instructional quality, and engagement levels (Mukherjee et al., 2024). In gamified learning environments, satisfaction is closely tied to students' enjoyment, sense of achievement, and perceived progress. When learners are satisfied with the course structure, gamified activities, and feedback mechanisms, they are more likely to sustain their motivation and perseverance in language learning (Jiang et al., 2021; She et al., 2021).

Although significant studies have been done in understanding individual components of L2 grit, existing research has yet to establish a comprehensive framework that integrates these elements within online gamified EAP learning environments. Most previous studies have examined these factors separately, failing to explore how their interactions collectively shape L2 grit. Furthermore, while qualitative and mixed-methods research has provided valuable insights into learners' L2 grit, there remains a need for rigorous quantitative analysis to better understand the intricate relationships among these constructs. To bridge this gap, this study employs advanced statistical modeling techniques, specifically Partial Least Squares Structural Equation Modeling (PLS-SEM), to investigate how academic self-efficacy, critical thinking, learning satisfaction, PEoU, and PU of gamification contribute to L2 grit in online EAP courses in Indonesia. As more Indonesian universities integrate digital learning tools into EAP curricula, understanding how gamification influences students' L2 grit becomes increasingly important. Based on the background, the research question guiding this study is: What are the interrelationships among academic self-efficacy, critical thinking, learning satisfaction, perceived ease of use and perceived usefulness of gamification, and L2 grit in online EAP courses?

Literature Review

The following section provides a theoretical review of the variables examined in this study. Each variable is discussed to develop the hypotheses. The variables include academic self-efficacy, critical thinking, learning satisfaction, PEoU and PU of gamification, and L2 grit.

Gamification

Gamification has gained increasing traction in educational domains to enhance motivation, engagement, and learning outcomes (Krath et al., 2021; Sailer & Homner, 2020; Wood & Reiners, 2015). Research shows that well-structured gamified interventions, such as leaderboards and team challenges, foster robust participation and deeper cognitive engagement (Legaki et al., 2020; Zainuddin, Chu, et al., 2020). Additional studies suggest that students benefit from immediate feedback and repeated practice through gamified quizzes, thereby improving content retention and on-task behavior (Putz et al., 2020; Sanchez et al., 2020). Moreover, combining flipped classrooms with targeted game mechanics has been shown to enhance social interaction and further boost learner motivation (Sailer & Sailer, 2021). The effectiveness of gamified learning tools is strongly related to its PEOU, the extent to which they believe the platform is user-friendly, intuitive, and requires minimal effort to navigate and PU, which refers to students' belief that using gamification will improve their learning efficiency and academic performance (Al-Gethami & Al-Sowat, 2024). If learners perceive gamified activities as beneficial for their skill development and comprehension, they are more likely to persist in their studies and fully engage with the material. Despite these promising findings, there is limited empirical evidence on how the perceived ease of use and usefulness of gamified platforms like Quizizz collectively impact L2 grit through the mediation of critical thinking, academic self-efficacy, and learning satisfaction. Addressing this interplay is crucial for guiding informed pedagogical strategies to optimize online EAP classrooms in Indonesian contexts. This study aims to illuminate the pathways by which gamification catalyzes sustained student grit, contributing valuable insights to EFL research.

Academic Self-Efficacy

In technology-enhanced contexts, academic self-efficacy is closely tied to digital fluency and the perceived usefulness of instructional platforms, which drive students' self-regulated learning strategies (Alamri, 2022; Hong et al., 2023). A growing body of research links heightened academic self-efficacy to improved academic outcomes, stronger problem-solving skills, and more sustained task persistence (Bai et al., 2022; Hanham et al., 2021; Prihandoko et al., 2024). Furthermore, supportive teacher-student relationships and social backing often bolster academic self-efficacy, fostering resilience and autonomy in varied educational settings (M. A. Chen et al., 2021; P Chen et al., 2020; Warshawski, 2022). While these findings underscore academic self-efficacy's broad relevance, there is insufficient clarity on how academic self-efficacy directly affects L2 grit in online EAP classes. This study seeks to provide evidence-based insights into the role of academic self-efficacy in catalyzing grit among Indonesian EFL undergraduates, thereby informing more effective pedagogical strategies.

Critical Thinking

Theoretically, critical thinking is both a goal and a process, guiding learners to question norms, integrate new knowledge, and refine reasoning (Darwin et al., 2024). Previous research suggests that flipped classrooms, concept mapping, and inquiry-based pedagogies reinforce cognitive skills by stimulating reflection and deeper engagement (Chen & Hwang, 2020; Etemadfar et al., 2020; Robillos & Phantharakphong, 2020; Wale & Bishaw, 2020). Technology adoption has also been beneficial for fostering critical thinking, particularly when learners possess digital literacy and readiness (Darwin et al., 2024; Indah et al., 2022; Liu et al., 2023). However, limited attention has been paid to how critical thinking directly influences L2 grit in gamified online learning environments. Addressing this oversight is essential to uncover how learners' critical thinking affects their perseverance in EFL contexts. The present study aims to offer new pedagogical strategies for cultivating L2 grit among undergraduate EFL learners.

Learning Satisfaction

Studies reveal that higher levels of satisfaction lead to robust academic engagement, improved retention, and deeper learning, particularly when instructional strategies like flipped classrooms are implemented (Cofini et al., 2022; Díaz et al., 2021; Salimon et al., 2021). While previous research explores diverse elements affecting learning satisfaction, such as social presence, cognitive absorption, and self-efficacy (Aldhahi et al., 2022; Haviz et al., 2024; Zhang et al., 2021), less attention has been given to how satisfaction influences L2 grit in online EAP contexts. Filling this gap is essential for designing pedagogical strategies that strengthen L2 grit by improving learning satisfaction through gamified instruction. This aligns with the present study's objective to explore how learning satisfaction impacts L2 grit in online language learning.

Second Language (L2) Grit

Research demonstrates that L2 grit not only mitigates negative affective states like boredom but also co-develops with positive variables such as foreign language enjoyment (Shirvan et al., 2021; Solhi et al., 2023). Although existing studies highlight the essential role of teacher-related factors, particularly emotional support, in fostering L2 grit (Derakhshan et al., 2023; Liu et al., 2023), few examine how technological interventions, including gamification, interact with this construct. Specifically, a gap exists in understanding how gamification—through perceived ease of use and usefulness—affects learners' academic self-efficacy, critical thinking, and learning satisfaction, and how these elements collectively shape L2 grit in online EAP contexts. Addressing this gap is crucial, as the interplay of these factors offers novel insights into sustaining language learners' perseverance. This study aims to enhance understanding of L2 grit by investigating these underexplored relationships, enriching pedagogical strategies within EFL practice.

Hypotheses

- H1: PEOU of gamification - academic self-efficacy
- H2: PEOU of gamification- critical thinking
- H3: PEOU of gamification - learning satisfaction
- H4: PU of gamification - learning satisfaction
- H5: PU of gamification - critical thinking
- H6: PU of gamification - learning satisfaction
- H7: Critical thinking - L2 grit
- H8: Academic self-efficacy - L2 grit
- H9: Learning satisfaction - L2 grit

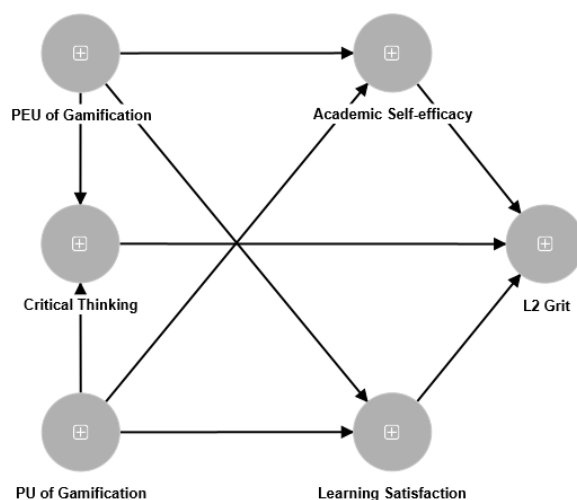


Figure 1. Model Specification

The proposed model in Figure 1 posits that perceived usefulness and perceived ease of use of gamification affect academic self-efficacy, critical thinking, and learning satisfaction by creating an environment in which students recognize tangible benefits and feel motivated to invest sustained effort. Enhanced academic self-efficacy is similarly hypothesized to bolster grit because learners who trust their capabilities are more inclined to persist despite challenges or setbacks. When students develop stronger critical thinking skills through gamified practices, they are more likely to maintain consistent motivation and perseverance in language learning, thus intensifying their L2 grit. Additionally, higher levels of learning satisfaction contribute to greater resilience and determination, potentially fueling a positive cycle of engagement and achievement in EAP contexts. By exploring the interrelationships among these factors, this study aims to provide a more comprehensive understanding of how gamification, through its influence on other key constructs, can collectively foster learners' L2 grit in Indonesian EFL classrooms.

Method

This study seeks to conduct an exploratory analysis of academic self-efficacy, critical thinking, learning satisfaction, perceived ease of use, perceived usefulness of gamification, and L2 grit by testing nine previously established hypotheses.

Participants

This study was conducted at a public university in Central Java, Indonesia, involving 300 EFL undergraduate students enrolled in an online EAP course. All participants actively used Quizizz as a primary assessment tool in their coursework. Quizizz is a free, game-based learning platform that enables teachers to create and deliver engaging, interactive quizzes. It was chosen for this study due to its widespread accessibility, ease of use, and proven effectiveness in promoting student engagement and motivation in online learning environments. Its ability to provide instant feedback and track performance makes it particularly suitable for formative assessment in EAP courses. The sample included students from diverse backgrounds, providing a rich context for analyzing the study variables. Table 1 presents the demographic distribution, detailing gender, origin, and major, ensuring a comprehensive snapshot of the study sample.

Table 1. Demographic Information (Total respondents = 300)

Parameter	Category	Number	Percentage (%)
Gender	Female	210	70
	Male	90	30
Origin	Regency	202	67.3
	Town	98	32.7
Major	Informatics Engineering	31	10.3
	International Logistics	137	45.7
	Marketing Management	65	21.7
	Midwifery	37	12.3
	Pharmacy	30	10

Ethical approval was obtained from the university's research department, ensuring that participants' rights and confidentiality were fully protected. The diversity of the sample

enhances the generalizability of the findings, offering a multidimensional perspective on how different student profiles engage with online EAP courses.

Research Instruments

To measure the variables, validated instruments were adapted from previous studies. Each instrument was translated into Indonesian using a back-translation process and underwent face validation by two doctoral candidates in translation studies and an English education professor with over 25 years of experience. This process ensured readability, clarity, and accuracy. The instruments for measuring perceived ease of use (3 items), perceived usefulness (4 items), and learning satisfaction (4 items) were adapted from Tao et al. (2022). Additionally, academic self-efficacy was measured using four items from Kumar et al. (2023), critical thinking with eight items from Van Laar et al. (2019), and L2 Grit with twelve items from Alamer (2021). A pilot study with 30 representative respondents confirmed that the instruments achieved acceptable reliability and validity indices, evidenced by a Cronbach's Alpha of 0.813 and R-values ranging from 0.388 to 0.428, surpassing the R-table threshold of 0.296 (Brown, 2002). These steps ensured the rigorous testing and refinement of all research instruments prior to full deployment.

Data Collection

In collecting the data, a total sampling technique was employed, in which all members of the target population were included in the study (Gaja et al., 2003). This method was chosen because the entire population, namely students enrolled in seven online EAP classes using Quizizz for assessments, was accessible and relevant to the research objectives. Data were collected via an online questionnaire using Google Form during the semester break in December 2024, a strategic period chosen to minimize academic workload pressures. This approach helped maximize response rates and reduce potential biases, as students had more flexible schedules to complete the survey. The questionnaire used a five-point Likert scale (1 = strongly disagree; 5 = strongly agree) to measure students' responses. Additionally, informed consent was embedded within the questionnaire, ensuring participants could only proceed after acknowledging voluntary participation.

Data Analysis

Data analysis was conducted using SmartPLS 4 software (Ringle et al., 2022), which involves two principal stages proposed by Hair et al. (2019). First, the measurement model assessment evaluated indicator loadings, internal consistency reliability, convergent validity, and discriminant validity, ensuring that the constructs accurately captured the intended theoretical dimensions. Second, the structural model assessment addressed multicollinearity issues and tested the proposed hypotheses, focusing on determining the coefficient of determination (R^2) and examining effect sizes (f^2). This structured approach enabled clear identification of the most influential predictors among the study's variables, shedding light on critical points of intervention or reinforcement. In addition, the method offered insights into the overall explanatory power of the model, guiding potential refinements of instructional strategies. Taken together, these analyses provided robust, data-driven conclusions about the interplay between perceived ease of use, perceived usefulness, learning satisfaction, academic self-efficacy, critical thinking, and L2 grit.

Results

This section outlines the study's results, emphasizing the analysis of the interrelationships among academic self-efficacy, critical thinking, learning satisfaction, perceived ease of use, perceived usefulness of gamification, and L2 grit in online EAP courses.

Measurement model assessment

Table 2 shows the indicator loadings, composite reliability (CR), and average variance extracted (AVE) for each construct. Indicator loading reflects the strength of the relationship between a construct and its corresponding indicators, with higher values denoting stronger associations. Composite reliability assesses the internal consistency of the constructs, serving as a measure of their reliability. To evaluate convergent validity, the average variance extracted (AVE) is used, indicating the extent to which a construct captures the variance of its indicators relative to measurement error.

Table 2. Indicator loading, Internal Consistency Reliability, and Convergent Validity Value

Construct	Indicator loading	Cronbach's alpha	CR	AVE
Academic Self-efficacy				
1. I can memorize what I study.	0.773	0.806	0.811	0.633
2. I am able to concentrate/pay attention in classes.	0.840			
3. I am able to plan work & study.	0.807			
4. I am able to study even when there are other interesting things to do.	0.759			
Critical Thinking				
5. Playing the Quizizz prompted me to provide substantiated reasoning for my answers.	0.873	0.897	0.906	0.765
6. While playing the Quizizz, I felt encouraged to support my ideas with evidence or examples.	0.920			
7. While playing the Quizizz, I was motivated to justify my viewpoints clearly.	0.894			
8. Playing the Quizizz enabled me to approach questions from different perspectives.	0.810			
L2 Grit				
9. I work hard towards my language learning goals irrespective of how long they take to achieve.	0.813	0.860	0.864	0.59
10. Even when I can do something more fun, I give language learning tasks my best effort.	0.816			
11. I am committed to the investment of my best effort in language learning tasks.	0.764			
12. Once I set a language learning goal, I try to overcome any challenge that arises.	0.764			
13. I become interested in new pursuits other than language learning every few months.	0.742			
14. I was obsessed with learning the language for a short period of time but lost interest eventually.	0.702			
Perceived Ease of Use of Gamification				
15. It is easy for me to use the Quizizz.	0.858	0.873	0.873	0.797
16. Using the Quizizz makes them easy for me to achieve the goal I want.	0.859			
17. It is easy for me to become skillful at using the Quizizz	0.865			
Perceived Usefulness of Gamification				
18. Using the Quizizz improves my performance in my learning.	0.867	0.825	0.825	0.741
19. Using the Quizizz save my time in achieving the learning goal I want.	0.852			
20. Using the Quizizz enhances the effectiveness in my learning.	0.861			
Learning Satisfaction				
21. I am satisfied with learning in Quizizz	0.906	0.825	0.828	0.740
22. I am pleased to earn my credit in Quizizz.	0.882			
23. Learning in Quizizz is a very delighting experience.	0.889			

As presented in Table 2, indicator loadings serve as a crucial metric for evaluating the reliability of observed variables. According to Hair and Alamer (2022), loadings are recommended to exceed 0.70, as this threshold indicates that approximately 50% of the variance in the indicators is explained by the corresponding constructs. Based on the analysis, several items were removed for failing to meet this criterion. The indicator loadings of the remaining items range from 0.702 to 0.92, showing that the observed variables in the study are reliably measured. Reliability and validity, critical pillars for measurement accuracy, were ascertained through Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Adhering to established criteria, values exceeding 0.7 for Cronbach's alpha and CR (Hair et al., 2019) imply high internal consistency and reliability. In our data, all constructs comfortably exceed this threshold. Furthermore, AVE values, indicative of convergent validity, should ideally be above 0.5 (Hair et al., 2019). In our results, all constructs surpass this benchmark, with the only close call being L2G with an AVE of 0.59. Thus, the model is categorized at a good level of internal consistency reliability with achieved convergent validity for all constructs.

Discriminant Validity

Table 3. Heterotrait-Monotrait Ratio (HTMT)

	ASE	CT	L2G	LS	PEoU	PU
ASE						
CT	0.583					
L2G	0.804	0.639				
LS	0.418	0.807	0.544			
PEoU	0.543	0.813	0.576	0.815		
PU	0.567	0.725	0.600	0.714	0.809	

ASE = Academic Self-efficacy, CT = Critical Thinking, L2G = Second Language Grit, PEoU = Perceived Ease of Use of Gamification, PUG = Perceived Usefulness of Gamification, LS = Learning Satisfaction

Table 3 above shows the results of the discriminant validity analysis, which evaluates the extent to which each construct is distinct from the others. One method for measuring it is the HTMT (heterotrait-monotrait ratio) criterion, where values less than one often confirm DV (Henseler et al., 2015). Analyzing the given HTMT data, all values fall below one. For instance, the HTMT value between academic self-efficacy and critical thinking is 0.583, and between PEoU and PU is 0.809. All these values are within the acceptable range of <0.850 (Hair et al., 2014), thereby confirming discriminant validity across the constructs. This analysis result implies that each construct within model does not overlap each other.

Structural model assessment

Multicollinearity Testing

Table 4. Variance Inflation Factor

	ASE	CT	L2G	LS	PEoU	PU
ASE			1.33			
CT			2.402			
L2G						
LS			2.063			
PEoU	1.808	1.808		1.808		
PU	1.808	1.808		1.808		

Table 4 presents the results of the multicollinearity assessment, which ensures that the constructs are not excessively correlated with one another—an issue that can obscure the interpretation of regression results. The variance inflation factor (VIF) is used to evaluate multicollinearity, with values ideally below 3.3 (Hair et al., 2006). In our analysis results, VIF values range from 1.33 (academic self-efficacy) to 2.402 (critical thinking). All these values are well below the critical thresholds, indicating no issues of multicollinearity. Additionally, based on the value obtained, it is demonstrated the absence of multicollinearity concerns.

Path Analysis

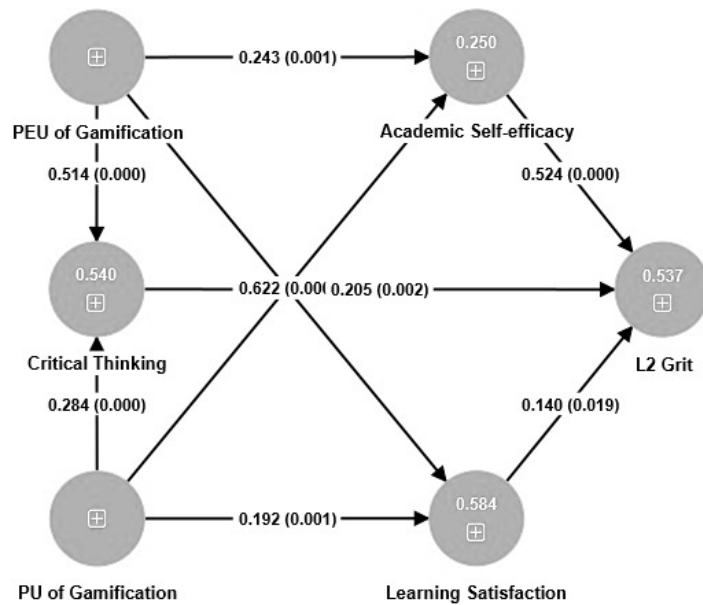


Figure 2. Path Coefficient

Using the bootstrapping method with a 5% significance level and a t-value threshold greater than 1.96 (Hair et al., 2017), the study examined the relationships among several constructs relevant to language learning. Figure 2 illustrates the structural model results, displaying the path coefficients and corresponding t-values. These values indicate the strength and significance of the hypothesized relationships between constructs. Paths with t-values exceeding 1.96 are considered statistically significant, thereby confirming the proposed relationships within the model.

Table 5. Path Analysis Result

Hypotheses	Path	β	Mean	SD	T Statistics	P Values	Significance
H1	PEoU -> ASE	0.243	0.244	0.074	3.290	0.001	Supported
H2	PEoU -> CT	0.514	0.514	0.062	8.343	0.000	Supported
H3	PEoU -> LS	0.622	0.621	0.050	12.553	0.000	Supported
H4	PU -> ASE	0.304	0.305	0.069	4.389	0.000	Supported
H5	PU -> CT	0.284	0.284	0.064	4.428	0.000	Supported
H6	PU -> LS	0.192	0.193	0.056	3.455	0.001	Supported
H7	CT -> L2G	0.205	0.205	0.066	3.100	0.002	Supported
H8	ASE -> L2G	0.524	0.527	0.046	11.383	0.000	Supported
H9	LS -> L2G	0.140	0.140	0.060	2.356	0.019	Supported

Table 5 shows the structural model results, including the original sample estimates (β), the means of the bootstrapped estimates, and their statistical significance. The Mean column reflects the average of the bootstrapped path coefficients, calculated from 5,000 resamples, and is presented alongside the β values to highlight the robustness and consistency of the model estimates. The study examined the relationships among several key constructs relevant to language learning. As illustrated in Figure 2, the β values (noted on the arrows) and the corresponding p-values (in brackets) confirm that all proposed hypotheses are supported.

Perceived ease of use (PEoU) of gamification was found to play a significant role in influencing academic self-efficacy, critical thinking, and learning satisfaction. This suggests that when students find learning media is easy to use, they are more likely to believe in their academic abilities, engage in critical thinking, and be satisfied with their learning experience. Perceived usefulness of gamification was seen to positively impact academic self-efficacy, critical thinking, and learning satisfaction. This emphasizes the importance of using gamification for learning media that students find valuable. Moreover, the relationships of academic self-efficacy, critical thinking, and learning satisfaction on L2 grit (ASE \rightarrow L2G) indicate that academic self-efficacy had a strong positive relationship with grit in language learning, suggesting that students who believe in their academic capabilities tend to display more persistence and determination in their language studies. Similarly, critical thinking (ASE \rightarrow L2G) and learning satisfaction (LS \rightarrow L2G) also positively influenced grit, although to a lesser extent.

Coefficient of determination (R^2) and Effect size (f^2)

The coefficient of determination (R^2) assesses the extent to which independent variables explain the variance in dependent variables. According to Hair et al. (2019), R^2 values of 0.25, 0.50, and 0.75 are classified as modest, strong, and very strong, respectively.

Table 6. Coefficient determination (R^2)

Construct	R-square	R-square adjusted	Consideration
ASE	0.25	0.245	Modest
CT	0.54	0.537	Strong
L2G	0.537	0.532	Strong
LS	0.584	0.581	Strong

In Table 6, academic self-efficacy displayed a modest R^2 value, implying a modest level of explained variance. Conversely, critical thinking, L2 Grit, and learning satisfaction all yielded strong R^2 values indicating a substantial explanatory power of their respective predictors.

Table 7. Effect size (f^2)

Path	f^2	Effect size
PEoU \rightarrow ASE	0.043	Small
PEoU \rightarrow CT	0.319	Medium
PEoU \rightarrow LS	0.514	Large
PU \rightarrow ASE	0.068	Small
PU \rightarrow CT	0.097	Small
PU \rightarrow LS	0.049	Small
CT \rightarrow L2G	0.038	Small
ASE \rightarrow L2G	0.446	Large
LS \rightarrow L2G	0.021	Small

Effect size (f^2) gauges the impact of individual predictors on a dependent variable (Hair et al., 2019). The category of f^2 values of 0.02, 0.15, and 0.35 is interpreted as small, medium, and large effects, respectively (Hair et al., 2019). In this study, academic self-efficacy's effect on L2G was large, signifying a pronounced influence. While critical thinking and learning satisfaction both had small effects on L2G, PEOU exerted a small effect on ASE, a medium effect on CT, and a large effect on LS. PU exhibited small effects on ASE, CT, and LS.

Discussion

The findings of this research demonstrate a clear and significant relationship between gamification and grit in language learning among EFL students. Specifically, the study highlights how perceived ease of use (PEoU) and perceived usefulness (PU) of gamified platforms in online classroom context directly influence academic self-efficacy, critical thinking, and learning satisfaction. PEOU was shown to positively impact academic self-efficacy, critical thinking, and learning satisfaction, while PU also enhanced these constructs. These factors, in turn, play pivotal roles in fostering L2 grit, with academic self-efficacy having the strongest relationship with grit. Additionally, critical thinking and learning satisfaction contribute positively to L2 grit, reflecting the multifaceted nature of perseverance and passion in achieving long-term language learning goals.

In this study, the significant influence PEOU of gamification on academic self-efficacy ($\beta = 0.243$, $p < 0.01$), critical thinking ($\beta = 0.514$, $p < 0.01$), and learning satisfaction ($\beta = 0.622$, $p < 0.01$) underscores the pivotal role of user-friendly game-based platforms in online learning environments. Gamification simplifies complex learning processes, reducing cognitive load and fostering confidence in students' ability to complete academic tasks. This aligns with Sailer and Homner (2020), who highlight the effectiveness of competition coupled with collaboration in sustaining motivation. Additionally, gamified learning environments promote critical thinking by challenging students to strategize and solve problems, a finding corroborated by Putz et al. (2020), who emphasize the importance of aligning game mechanics with pedagogical goals. Learning satisfaction, on the other hand, stems from the enjoyable, interactive nature of gamification, as evidenced by Fernandez-Rio et al. (2020), who note that gamified platforms enhance emotional engagement and intrinsic motivation.

However, the effectiveness of gamification may vary depending on demographic and contextual factors. Smiderle et al. (2020) and Legaki et al. (2020) suggest that age, gender, and personality traits influence learners' responses to game elements, indicating a need for personalized designs. Moreover, avoiding novelty fatigue, as pointed out by Sanchez et al. (2020), requires continuous innovation in game mechanics. Taken together, these findings demonstrate that gamification, when thoughtfully integrated, can enhance academic self-efficacy, critical thinking, and learning satisfaction, creating a comprehensive foundation for fostering grit in language learning.

Importantly, the influence of PEOU and PU must be considered in light of the learners' overall digital literacy and technical skills, which can vary widely in online EAP populations and affect their ability to engage effectively with gamified tools. Course designers should therefore ensure that gamified platforms are accessible and user-friendly to accommodate diverse technical competencies, thereby maximizing motivational and cognitive benefits. The results extend prior findings by illustrating how gamification not only motivates students but also builds their cognitive and affective capacities, such as academic self-efficacy, critical thinking, and learning satisfaction. These insights deepen the understanding of gamification's role in fostering grit and suggest practical implications for integrating game-based learning in EFL online classrooms to enhance both short-term engagement and long-term perseverance.

The positive significant effect of PU of gamification, as demonstrated through the Quizizz platform, on academic self-efficacy ($\beta = 0.304, p < 0.01$), critical thinking ($\beta = 0.284, p < 0.01$), and learning satisfaction ($\beta = 0.192, p < 0.01$) highlights the transformative potential of gamified learning tools in educational contexts. The intuitive and functional nature of Quizizz likely enhances students' academic self-efficacy by making the learning process more accessible and manageable, aligning with findings by Putz et al. (2020), who emphasize the role of clear integration between game mechanics and learning objectives. Similarly, the platform's interactive features encourage deeper engagement with the content, fostering critical thinking by prompting students to analyze and strategize—an effect also noted by Zainuddin et al. (2020) in their exploration of gamified assessments. Moreover, Quizizz's engaging environment creates a less stressful and more enjoyable learning experience, increasing learning satisfaction, as previously reported by Fernandez-Rio et al. (2020). These results further validate the findings of Sailer and Homner (2020), who underscore the role of competition and collaboration in maintaining long-term motivation, and they echo the conclusions of Saleem et al. (2022) on gamification's ability to reduce learning anxiety. However, as suggested by Sanchez et al. (2020), the novelty effect of such platforms must be mitigated through periodic updates to maintain students' engagement over time. Collectively, these findings indicate that perceived usefulness is a critical determinant of academic self-efficacy, critical thinking, and learning satisfaction, providing valuable insights for optimizing gamification in online EAP contexts.

The strong positive relationship between academic self-efficacy and L2 grit ($\beta = 0.524, p < 0.01$) indicates that students confident in their academic abilities tend to demonstrate perseverance and passion for achieving their long-term goals in language acquisition. This finding is consistent with the self-efficacy theory, which posits that belief in one's capabilities can significantly enhance persistence and resilience in challenging tasks (Bai et al., 2022; Hanham et al., 2021). Similarly, the positive influence of critical thinking ($\beta = 0.205, p = 0.002$) and learning satisfaction ($\beta = 0.14, p = 0.019$) on grit highlights how engaging in reflective thought and deriving satisfaction from the learning experience foster students' determination to succeed. Critical thinking enables learners to approach complex problems systematically, enhancing their problem-solving skills and academic engagement (Etemadfar et al., 2020; Riswanto et al., 2022), while learning satisfaction reinforces motivation and emotional well-being, driving sustained effort (Bossman & Agyei, 2022; Cofini et al., 2022). These findings extend prior research, which largely focused on the effects of L2 grit on language anxiety reduction, online learning engagement, and academic performance (Chen & Hwang, 2020). By identifying the underlying constructs that contribute to grit development, this study provides a more nuanced understanding of grit's antecedents. Moreover, this work supports previous observations that ASE, critical thinking, and satisfaction correlate positively with perseverance across various domains (Adams et al., 2020; Kim & Park, 2021; Liu et al., 2023). These insights underscore the importance of fostering confidence, satisfaction, and reflective skills in online EAP contexts to cultivate grit in language learners, thereby advancing pedagogical strategies for sustained academic achievement.

Conclusion

This study provides robust insights into the role of gamification in fostering grit among EFL learners in online classrooms. By exploring the interplay between academic self-efficacy, critical thinking, learning satisfaction, perceived ease of use and perceived usefulness of gamification, and L2 grit, this research highlights how user-friendly academic self-efficacy and purposeful gamified platforms significantly influence these constructs. The findings confirm that PEOU and PU of gamification not only enhance between academic self-efficacy, critical thinking, and learning satisfaction but also collectively contribute to the development of L2

grit, a key determinant of long-term perseverance in language learning. Academic self-efficacy emerged as the strongest predictor of grit, demonstrating the critical role of confidence in academic abilities. These outcomes enrich ongoing academic debates on gamification's cognitive and affective impacts, offering compelling evidence for its potential to enhance motivation and engagement in online learning environments. Within the international academic community, this study underscores the transformative role of gamification in supporting sustained language acquisition efforts.

The implications of these findings are twofold, encompassing both theoretical advancements and practical applications. Theoretically, this research contributes to the understanding of gamification's effectiveness by integrating it within the framework of grit development and self-efficacy theory. The results validate existing literature on gamified learning while extending it by emphasizing the nuanced relationships among cognitive, affective, and behavioral constructs in language education.

Practically, these insights offer actionable strategies for EFL educators and instructional designers. Teachers are encouraged to leverage gamified platforms like Quizizz to add variety to learning activities and simplify complex tasks. By breaking content into smaller, interactive quiz segments that introduce a sense of competition among peers, the platform fosters joyful and engaging learning experiences. Its features—such as visual progress tracking, points, timers, and leaderboards—not only boost motivation but also help reduce boredom and anxiety often associated with English learning. In classroom settings, Quizizz can be effectively used to support various English skills, including listening, reading, vocabulary, and grammar. These technical affordances align well with cognitive principles of multimedia learning and instructional design, making Quizizz a practical and effective tool for enhancing learner engagement, motivation, and persistence. Policymakers and school administrators can use these findings to advocate for technology integration in curricula, ensuring that platforms are regularly updated to sustain novelty and interest. Specific strategies, such as aligning game mechanics with pedagogical goals and incorporating elements of competition and collaboration, can amplify the positive effects of gamification on student outcomes.

Future research could address several critical areas to build on these findings. While this study elucidates the relationships between gamification and grit, it is limited by its cross-sectional design and reliance on self-reported data, which may be subject to social desirability bias and cannot capture changes over time. Moreover, the sample consisted of EFL learners from a specific educational context, limiting the generalizability of the findings to broader or more diverse populations. Additionally, demographic and contextual variables, including age, gender, and personality traits, warrant deeper investigation to optimize gamification designs for different learner groups. The potential limitations of gamified platforms, such as novelty fatigue, further underscore the need for longitudinal studies to examine the sustainability of gamification's impact over time.

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