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Research Article

Who buys the game? Age, proficiency, and digital skill in Greek EFL learners' acceptance of gamification

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ABSTRACT

This quantitative study explores Greek secondary-school students' perceptions of gamified English language learning through an acceptance-first lens that combines the technology acceptance model and the unified theory of acceptance and use of technology. Data were collected from 138 students using a structured questionnaire adapted into Greek following the International Test Commission guidelines for translating and adapting tests (2017) and validated through internal-consistency analysis and confirmatory factor modelling. The instrument captures perceived usefulness (PU), behavioral intention (BI), engagement, and time-on-task as mediating constructs linking game design to acceptance outcomes. Game elements such as points, leaderboards, timed rounds, and narrative framing were evaluated for their relevance to classroom goals and learner motivation. Findings show that PU strongly predicts BI, while engagement functions as a key mediator between design and acceptance. Age and digital literacy emerge as moderating variables, shaping both motivation and uptake. Overall, the results underscore that the pedagogical effectiveness of gamification lies not in the mere inclusion of game elements, but in their deliberate alignment with cognitive and affective dimensions of learning.

Keywords: gamification, English as a foreign language, technology acceptance, perceived usefulness, behavioral intention, unified theory of acceptance and use of technology

INTRODUCTION

Gamification, the use of game design elements in non-gaming settings, has become a promising approach for improving English language teaching (ELT) and learning. Empirical studies show that gamification strategies can notably boost student engagement, motivation, and language skills in different areas of English education.

One of the key benefits of gamification in ELT is its ability to improve students' engagement and motivation. Jie et al. (2023) showed that students view gamification positively in speaking lessons and have requested its use in future English classes, aligning with findings from multiple studies that highlight its positive impact on students' participation in English language learning environments (Yazid et al., 2024). Likewise, Zhang and Hasim's (2023) systematic review emphasizes that gamification elements like leaderboards and progress tracking significantly boost motivation and engagement, creating a competitive yet collaborative learning environment.

Furthermore, gamification has been demonstrated to improve specific language skills such as reading comprehension and vocabulary acquisition. Utami et al. (2024) examine gamified e-modules designed to enhance reading comprehension, illustrating how such frameworks support the development of vital reading

abilities through engaging activities. This idea is supported by Nugraha and Sembiring (2023), who claim that gamification strategies significantly enhance classroom language activities. Additionally, Zainal (2023) notes that although students recognize the advantages of gamification in vocabulary learning, challenges related to digital literacy need to be addressed to optimize learning outcomes.

The integration of gamification can also strengthen intrinsic motivation and self-efficacy among learners. Hersi (2014) discusses how gamification strategies enhance learner engagement by using game mechanics that promote a sense of achievement and progression. Aligning game mechanics with educational objectives supports the development of students' confidence and competence in language skills, a vital benefit highlighted in various studies exploring the psychological aspects of gamification (Aldama-Juárez et al., 2024; Nugraha & Sembiring, 2023).

Teacher attitudes towards gamification significantly influence its effective implementation. Although many educators acknowledge the benefits of gamified approaches, they may nevertheless remain ambivalent or skeptical about how feasible such practices are within traditional educational settings (Spathopoulou & Pitychoutis, 2024; Zhang & Hasim, 2023). Overcoming these concerns through professional development and informative workshops could promote wider acceptance of gamification techniques, ultimately enhancing the learning experience.

Overall, these insights highlight the multiple benefits of gamification in ELT, from increased student engagement and motivation to enhanced language skills and confidence. The adoption of gamified approaches can revolutionize classroom dynamics, making language learning more interactive and enjoyable for learners. As teachers and institutions navigate the challenges of language education, strategically including gamification is likely to be key in creating more effective and engaging learning environments.

LITERATURE REVIEW

Defining Gamification in Education and Distinguishing It From Game-Based Learning

In education, gamification refers to the incorporation of game design elements into non-game contexts to enhance motivation and participation (Deterding et al., 2011; Hamari et al., 2014; Seaborn & Fels, 2015). These elements, such as points, badges, leaderboards, levels, progress bars, time limits, and narrative framing, indicate that the core activity remains a typical course or activity but is enhanced with specific mechanics designed to increase engagement and support learning. This approach differs from game-based learning or serious games, where learners engage within a complete, purpose-built game focused mainly on learning; in gamification, the course continues as usual, with mechanics added on top of it (Seaborn & Fels, 2015). This definition has become standard in reviews and meta-analyses, serving as the foundation for research in both higher education and language classrooms (Deterding et al., 2011; Hamari et al., 2014).

In language education, the practical application is clear: most schools and universities employ basic gamification, such as the PBL triad (points, badges, and leaderboards), primarily through quizzes and short practice exercises. More advanced approaches integrate team activities, storytelling or quests, and feedback loops to facilitate longer, communicative tasks. This focus on elements explains why the effectiveness varies depending on the outcome area and the length of exposure (Sailer & Homner, 2020; Seaborn & Fels, 2015).

Integration Acceptance as the Proximal Lens: TAM/UTAUT Constructs and Moderators

Since this research focuses on attitudes towards gamification rather than achievement itself, the most relevant theoretical framework is technology acceptance. In technology acceptance model (TAM), perceived usefulness (PU) and perceived ease of use are key beliefs influencing acceptance; PU and behavioral intention (BI) are particularly good predictors of adoption (Davis, 1989). Unified theory of acceptance and use of technology (UTAUT) and UTAUT2 expand this approach by including performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation, with age, gender, and experience acting as moderators (Venkatesh et al., 2003, 2012). In EFL gamification, PU and BI are natural outcome variables: learners might find a mechanic useful for learning but choose not to continue using it (or the reverse), with demographic factors such as age, proficiency, and computer literacy likely moderating these relationships.

Mechanisms That Connect Game Elements to Acceptance and Learning

Two complementary theoretical strands help connect element choice to acceptance and learning outcomes. The first one is self-determination theory (SDT) and motivational affordances. SDT suggests that ongoing engagement relies on fulfilling the needs for autonomy, competence, and relatedness. Gamified elements serve as affordances for these needs- such as team leaderboards enhancing relatedness, immediate feedback boosting competence, and narrative or quests fostering autonomy through meaningful choices. If a design focuses solely on comparative rankings without providing informational feedback or emphasizing cooperation, it can create pressure and diminish autonomy and relatedness for some learners, which may negatively impact BI, even if PU is initially high. Accordingly, design guidelines for leaderboards recommend careful considerations regarding their presentation, detail level, and framing to avoid harmful social comparisons (Park & Kim, 2021).

The second is the theory of gamified learning (TGL). TGL redefines gamification as an indirect influence on learning: elements alter mediators such as time-on-task, engagement, and feedback-driven processing, which subsequently impact performance; moderators (e.g., learner characteristics, task type, and design depth) influence the magnitude and even the direction of effects (Landers, 2014). TGL therefore explains why light PBL packages reliably increase behavioral engagement but produce mixed achievement results unless combined with informational feedback, cooperation, and task-aligned challenges. SDT and TGL together accurately predict the divergence of the results across PU and BI aspects.

What the Evidence Shows: Engagement Is Robust, Learning Is Design-Sensitive

Four strands of evidence summarize the field.

- Meta-analytic baselines. Various quantitative analyses consistently show small to moderate positive effects on motivation and engagement, with smaller, more varied gains in achievement. For instance, Sailer and Homner (2020) found significant positive impacts across cognitive ($g \approx .49$), motivational ($g \approx .36$), and behavioral outcomes ($g \approx .25$). However, reviews highlight that these effects heavily depend on context, design complexity, and the specific outcomes measured, aligning with Hamari et al.'s (2014) earlier statement that effects are "greatly dependent on context".
- Classroom design features. Details in classroom design, such as leaderboards, teams, and feedback, are important. Studies in experimentation and development show that team leaderboards and point systems can boost intrinsic motivation and a sense of relatedness in large lectures. However, the impact on competence varies, especially when high-quality, immediate feedback is lacking (Sailer & Sailer, 2020). Best practices for leaderboard design suggest combining macro (course-level) and micro (task-level) views and emphasizing progress-focused visualizations to minimize harmful social comparisons (Park & Kim, 2021).
- EFL-oriented platforms and tasks. Gamified environments in language teaching often involve quiz-based gamification using SRS tools like Kahoot! and Quizizz. A comprehensive review highlights positive impacts on classroom atmosphere and student performance when factors such as timing, immediate feedback, and low-stakes competition are emphasized (Wang & Tahir, 2020). ESL-specific case studies support these findings, demonstrating high engagement and positive attitudes toward Quizizz (Yunus & Tan, 2021). These approaches are well-suited for vocabulary and form-focused practice, e.g., tasks that are compatible with project-based learning and benefit from quick retrieval practices coupled with corrective feedback.
- Methodological limitations in the literature. Recent critiques highlight that many studies are short-duration, often lack mediator measures (such as time-on-task logs or need satisfaction), and sometimes blur the line between gamification and game-based approaches, making causal inference difficult. There are now common calls for clearer reporting of the specific element bundle used and for protocols that pre-specify moderators and theorized mediators (Hamari et al., 2014; Orsoni et al., 2023).

Why PU and BI Can Diverge in Gamified EFL

Within the acceptance framework, PU and BI can vary independently. Three design-sensitive mechanisms account for the observed pattern of positive and negative slopes at the item level.

1. Competence without autonomy or relatedness can be an issue. Individual leaderboards make progress clear by increasing PU, but if they are highly noticeable or permanent, they may lower BI among lower-ranked learners by causing anxiety, pressure, or social comparison that leads to disengagement. Using team or progress-banded displays can reduce these side-effects (Nicholson, 2015; Park & Kim, 2021).
2. Surface rewards without feedback. PBL-only packages increase short-term engagement but often do not alter learning processes; without immediate, informative feedback, learners may focus only on completing tasks and report reduced motivation to continue (Hamari et al., 2014; Sailer & Sailer, 2020).
3. Novelty and task demands influence learning outcomes. Short drills, such as vocabulary exercises, tend to show aligned PU and BI when using PBL combined with feedback. In contrast, longer communicative tasks that involve storytelling, team collaboration, and detailed feedback are necessary to sustain BI, which explains why there is variation across different item features and types of tasks (Seaborn & Fels, 2015; Wang & Tahir, 2020).

Moderators and Boundary Conditions: Age, Proficiency, and Digital Skills

Evidence and theory indicate that acceptance and efficacy are influenced by learner and task features.

Younger groups tend to be more affected by public rankings and gain more from cooperative approaches like team leaderboards and rotating roles compared to competitive individual designs. At the university level, students can better take advantage of challenge-based or voluntary competition if they retain the option to choose and receive feedback (Park & Kim, 2021; Sailer & Sailer, 2020). These patterns likely explain why some usefulness and intent items show opposite signs across different age groups.

Language proficiency (education level). In line with TGL and SDT, lower-intermediate learners tend to benefit most from high-frequency retrieval practice (PBL + feedback) focused on discrete targets (lexis and forms), as these exercises increase time-on-task and perceived competence through immediate correction. Conversely, advanced learners targeting productive skills (speaking and writing) need narrative or quest structures, peer and teacher feedback, and autonomy-supportive choices; PBL alone rarely sustains their motivation. This mapping illustrates the distribution of positive and negative slopes relative to proficiency, aligning with both meta-analytic and classroom evidence (Sailer & Homner, 2020; Wang & Tahir, 2020).

Computer and digital literacy, modelled on UTAUT's moderation framework, influence both PU and BI. Tech-confident learners quickly adopt and appreciate more features, while those with lower digital skills face difficulties and increased time investment, which can reduce BI even if PU remains high. Acceptance research often treats experience and age as moderators (Venkatesh et al., 2003, 2012). Additionally, classroom design strategies focus on onboarding processes and gradual disclosure of features to ease adaptation.

EFL Use-Cases: What Works For What

A pragmatic synthesis for language teaching emerges from the literature:

- **Vocabulary/short retrieval practice.** PBL plus immediate corrective feedback (timed quizzes; SRS platforms) typically yields aligned gains in PU and BI in the short run (Wang & Tahir, 2020; Yunus & Tan, 2021).
- **Grammar/form-focused drills.** Benefits depend on feedback quality and social framing; team tournaments or team leaderboards with item-level feedback support competence *and* relatedness (Sailer & Sailer, 2020).
- **Speaking, listening, writing/complex production.** Positive signals are strongest where narrative and team interdependence are combined with formative feedback and revision; PBL alone rarely suffices for sustained intention in these domains (Sailer & Sailer, 2020; Seaborn & Fels, 2015).

These patterns provide a principled interpretation framework for the Greek cohort: adolescent, mixed-proficiency learners in private language school contexts are primed to respond differentially to competition

versus cooperation and to value feedback-dense mechanics in line with the tasks they face during the school year.

Reporting and Methodological Standards

Recent critiques stress three reporting priorities that this study meets:

1. **Element-level transparency:** specify which elements were implemented (e.g., points, team leaderboard, timed rounds, and narrative frame) and why they were chosen relative to the target task (Hamari et al., 2014; Seaborn & Fels, 2015).
2. **Theorized mediators/moderators:** state a priori which mediators (time-on-task, engagement, feedback uptake) and moderators (age, proficiency, digital literacy) are relevant, referencing TAM/UTAUT and TGL (Landers, 2014; Venkatesh et al., 2003, 2012).
3. **Fit-for-purpose diagnostics and outcomes**: report acceptance outcomes (PU and BI) and process metrics, alongside any performance indicators. This approach is consistent with acceptance-first studies of classroom gamification and with leaderboards research, which recommends design-specific evaluation (Park & Kim, 2021; Wang & Tahir, 2020).

Synthesis and Implications For the Present Study

The literature provides a clear framework for understanding results. First, gamification is not a single method; the combination of elements and their presentation style matter. Second, constructs like PU and BI are influenced by moderators related to predictors such as age, proficiency, and digital literacy. These generally follow consistent patterns: older, more skilled, and digitally literate learners tend to be more selective and might resist purely extrinsic or competitive approaches unless options like choice, team connection, and informational feedback are included. Third, the type of task, whether involving quick drills or longer communication, determines whether PBL alone suffices or whether storytelling and cooperation are needed to keep PU and BI aligned over time.

Finally, observing that certain usefulness features increase with proficiency or digital literacy, while others decrease, reveals design-sensitive variations backed by relevant research. Elements like progress indicators and immediate feedback improve usefulness and motivation during retrieval tasks. However, prominent individual rankings without options or social support can reduce motivation, even when learners see short-term advantages (Park & Kim, 2021; Sailer & Sailer, 2020; Wang & Tahir, 2020). This pattern closely matches the predictions of both theoretical and empirical studies involving adolescent, mixed-proficiency EFL groups.

Research Questions and Hypotheses

Against this backdrop, the present study examines Greek EFL learners' acceptance of classroom gamification, viewed through PU and BI as key constructs of the TAM. Specifically, it explores the following research questions (RQs).

Research questions

RQ1: What is the overall profile of Greek EFL learners' attitudes towards classroom gamification, in terms of PU and BI to participate in gamified activities?

RQ2: How do learners' age, English proficiency, and self-assessed computer literacy influence their PU of and willingness to engage in classroom gamification, which includes features like feedback, progress tracking, competition, and repetition?

Hypotheses

Building on previous research into technology acceptance and gamification in education, the study tests the following hypotheses (Hs):

H1: Learners generally have positive attitudes towards classroom gamification, as indicated by mean PU and BI scores that are higher than the neutral midpoint of the response scale.

H2: Learners' age, English proficiency, and computer literacy will each be systematically associated with PU and BI: older, higher-proficiency, and more digitally literate learners will show stronger

Table 1. Age distribution of population

Characteristic	Number	Percentage (%)
< 14	11	7.97
14-15	73	52.90
16-18	30	21.74
> 18	24	17.39
Total	138	100

endorsement of feedback and progress-oriented gamified features and weaker endorsement of purely competitive, repetitive, or reward-only features.

METHODOLOGY

Design

The study used a cross-sectional, correlational survey based on the technology-acceptance model. In line with the TAM, PU, and BI were considered the primary indicators of learners' acceptance of classroom gamification (Davis, 1989). To incorporate extensions from the UTAUT/UTAUT2, acceptance was viewed as influenced by learner characteristics, especially age and experience, which are likely represented by English-proficiency level and self-reported computer literacy in classroom settings (Venkatesh et al., 2003, 2012; Xue et al., 2024). In this model, gamified elements affect PU, such as through perceived performance improvements, and PU influences BI, with age, proficiency, and digital experience modulating these relationships.

Operationally, PU and BI were each evaluated using six Likert-type items (1 = strongly disagree to 5 = strongly agree) in Greek, administered through Google Forms during scheduled lessons. Data collection occurred in the southern suburbs of Athens from November to December 2025, employing a convenience sample of 138 EFL learners. The explanatory variables were coded as ordered factors: age (under 14, 14-15, 16-18, and over 18), English proficiency (Pre-FCE, FCE, and CAE), and computer literacy (low, intermediate, and advanced). These coding allow the interpretation of estimated slopes as the expected change in item or scale scores associated with a one-step increase on each predictor. Details on the sampling approach, setting, and procedures are provided in participants and procedure; instrument adaptation and quality assessments (translation/back-translation, internal consistency, and structure) are discussed in instruments.

The analytic approach was intentionally both diagnostic and confirmatory. Since acceptance tends to be multifaceted in adolescent groups, we supplemented scale summaries with item-level ordinary least squares (OLS) models, where each PU/BI item was independently regressed on factors like age, proficiency, or computer literacy. This approach reveals which aspects of usefulness and intention vary in strength across different learner groups, rather than assuming a uniform effect. For clarity and to align with UTAUT's focus on demographic factors, we initially present single-predictor models for each outcome. Model validity was checked using standard fit and assumption assessments, with effect estimates provided alongside standard errors and 95% confidence intervals.

Within this TAM/UTAUT-aligned design, the study's primary aim was to examine the acceptance pattern, identifying which aspects of gamification adolescents find useful and intend to use, as well as how these perceptions vary according to age, language proficiency, and digital experience in the Greek EFL context (cf. Davis, 1989; Venkatesh et al., 2003, 2012).

Setting and Participants

A total of 138 EFL learners from the southern suburbs of Athens participated (convenience sample; November-December 2025). The sample was adolescent-heavy, with 52.9% aged 14-15 (n = 73), 21.7% aged 16-18 (n = 30), 17.4% older than 18 (n = 24), and 8.0% younger than 14 (n = 11) (**Table 1**).

English proficiency ranged from Pre-FCE to CAE levels. Nearly half of the learners were low-intermediate (n = 67, 48.6%), about one-third were intermediate (n = 47, 34.1%), and 17.4% were advanced (n = 24) (**Table 2**). Proficiency increased with age: among the > 18 group, 66.7% were intermediate and 20.8% were advanced (compared to 12.5% low-intermediate), while the 14-15 age group was mostly low-intermediate learners

Table 2. English proficiency level

Criteria	Characteristics	Number	Education level
Age	< 14	9	Low intermediate
		1	Intermediate
		1	Advanced
	14-15	48	Low intermediate
		16	Intermediate
		9	Advanced
	16-18	7	Low intermediate
		14	Intermediate
		9	Advanced
	> 18	3	Low intermediate
		16	Intermediate
		5	Advanced
Education level	Low intermediate	67	48.55%
	Intermediate	47	34.06%
	Advanced	24	17.39%
Total		138	100%

Table 3. Computer literacy distribution

Criteria	Characteristics	Number	Computer literacy
Age	< 14	7	Low
		3	Intermediate
		1	Advanced
	14-15	22	Low
		39	Intermediate
		12	Advanced
	16-18	11	Low
		13	Intermediate
		6	Advanced
	> 18	5	Low
		7	Intermediate
		12	Advanced
Computer literacy	Low	44	31.88%
	Intermediate	63	45.65%
	Advanced	31	22.46%
Total		138	100%

(65.8%; 48/73). The 16-18 age group showed a more balanced distribution (23.3% low-intermediate, 46.7% intermediate, 30.0% advanced). The < 14 group was, as expected, mainly low-intermediate (81.8%).

Self-reported computer literacy was mainly at the intermediate level (n = 63, 45.7%), followed by low (n = 44, 31.9%) and advanced (n = 31, 22.5%) (**Table 3**). A clear age gradient was visible: advanced computer literacy was most common in the > 18 group (50.0%), moderate in 16-18 (20.0%) and 14-15 (16.4%), and least common in < 14 (9.1%). Conversely, low literacy characterized 63.6% of the < 14 group and 30.1% of 14-15, decreasing to 20.8% in > 18.

Participation was voluntary. Teachers introduced the study during class and shared the survey link; students completed the questionnaire electronically via Google Forms on their own devices under typical classroom conditions. No monetary incentives were offered.

Instruments

Attitudes toward gamification

Students' attitudes toward gamification were measured using a short, structured battery included in the same questionnaire (in Greek). Items targeted PU/learning value, enjoyment/engagement, social interaction and cooperation, and perceived concerns or risks (e.g., undue competition). All items used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The construct is grounded in widely used definitions of gamification as the "use of game design elements in non-game contexts" and in evidence that impacts are

context-dependent (Deterding et al., 2011; Hamari et al., 2014). Dimensionality and internal consistency are reported in the results (α and ω).

Measurement of TAM/UTAUT constructs

This study employed a cross-sectional survey to examine the acceptance of classroom gamification among EFL students, utilizing the TAM and the UTAUT as theoretical frameworks. In TAM, PU and BI are proximal determinants of technology uptake; UTAUT extends this logic via constructs such as performance/effort expectancy, social influence, and facilitating conditions (Tsappi et al., 2024). In line with our RQs and to keep respondent burden low in adolescent cohorts, we operationalized two core acceptance outcomes:

(a) PU of gamified classroom activities and

(b) BI to engage with such activities.

These outcomes are then modelled as functions of age, English-proficiency band (Pre-FCE, FCE, CAE; treated as ordered), and self-reported computer literacy (low/intermediate/advanced; ordered).

Instruments (TAM/UTAUT constructs)

Two brief acceptance scales were administered in Greek on a five-point Likert continuum (1 = strongly disagree to 5 = strongly agree), delivered via Google Forms during class time (November-December 2025).

- PU: six items (PU1-PU6) targeting the extent to which gamified activities are judged to improve learning effectiveness, efficiency, or productivity in EFL tasks (e.g., progress cues, immediate feedback, and team mechanics). Scale scores are the mean of completed items (≥ 80% item completion required).
- BI: six items (BII1-BII6) indexing intention/willingness to participate in gamified classroom tasks in the near term (e.g., willingness to use point-based challenges, quests, or team competitions as part of regular coursework). Scale scores are computed as the mean of completed items.

Predictors (coded as ordered factors)

- Age: four bands (< 14, 14-15, 16-18, > 18); analyzed as an ordinal step predictor.
- English proficiency (“education level”): Pre-FCE, FCE, CAE (ordered).
- Computer literacy: low, intermediate, advanced (ordered).

These coding align with the single-predictor OLS models reported in tables and preserve the interpretability of unstandardized slopes as Likert-unit change per one step increase in the predictor.

Translation, cultural-linguistic adaptation, and measurement quality

All items were forward-translated into Greek by the research team and back-translated by an independent professional translator. Discrepancies were reconciled to ensure semantic, idiomatic, and conceptual equivalence, following the International Test Commission (ITC) guidelines for translating and adapting tests (ITC, 2017). Internal consistency is reported at the scale level for PU and BI using Cronbach’s α and McDonald’s ωt (omega total).

Statistical analysis

Descriptives and reliability are reported for PU and BI. Item-level OLS models regress each PU/BI item on age, proficiency, or computer literacy separately to reveal facet-specific patterns (β, SE, 95% confidence interval; p values two-tailed, α = .05). Model adequacy is documented using F restricted-unrestricted tests and Durbin-Watson (DW) statistics. Where appropriate, scale-level models using composite PU/BI means are also provided as robustness checks.

Procedure and Data Management

Teachers distributed the Google Forms link during scheduled lessons. The landing page presented a plain-language information sheet outlining the study’s aims, the voluntary nature of participation, the expected completion time, and the data protection arrangements. Proceeding with the questionnaire constituted informed consent.

Survey settings limited multiple submissions (one response per account). Raw data were exported to a statistical package for cleaning and analysis. Prior to modelling, we

(a) screened for missingness at the item and scale level,

(b) removed fully blank or < 50%-complete cases (none were anticipated after classroom administration), and

(c) examined straight-lining and response-time outliers to flag careless responding.

Analytic Strategy

Analyses proceeded in three stages, aligned with the RQs and the TAM/UTAUT framing of PU and BI.

- Descriptives and reliability. We first summarized the distribution of all PU and BI items and their composite scales using means, standard deviations, and 95% confidence intervals. Internal consistency for each scale was estimated with Cronbach's α and McDonald's ω, given ω's advantages when the assumption of tau-equivalence is unlikely to hold in Likert-type data (Dunn et al., 2014). Item-total correlations and α-if-deleted values were inspected to identify any items that might compromise reliability; none warranted removal.
- Item-level regression models. To address **RQ2** and test **H2**, we fitted OLS regression models for each PU and BI item separately. In each model, the Likert response (1-5) was regressed on one ordered predictor: age band, English-proficiency band, or self-reported computer literacy. Predictors were coded as ordinal step variables, so that the unstandardized slope can be interpreted as the expected change in item score (in Likert units) associated with a one-step increase in age, proficiency, or digital literacy. For each family of models (R_1-R_3 for PU, R_4-R_6 for BI), we report intercepts, slopes, standard errors, 95% confidence intervals, p values (two-tailed, α = .05), and R^2.
- Model diagnostics and robustness. Model adequacy was evaluated using restricted-unrestricted F tests and DW statistics, confirming that the imposed linear structures did not degrade fit and that there was no evidence of serial correlation in the residuals. These diagnostics support the use of OLS estimators. Where appropriate, we also examined composite PU and BI means in supplementary models as a scale-level robustness check; however, the main emphasis in the Results is on item-level patterns, which are more informative for identifying selective acceptance of specific gamified features.

All analyses were conducted in standard statistical software, with reproducible scripts retained by the authors and available on reasonable request.

Ethical Considerations

Ethical approval for this study was granted by the Research Unit at the American University of the Middle East (approval code PA-2025-2026-0183), on November 10, 2025. In accordance with the 2013 revision of the Declaration of Helsinki and the GDPR (EU 2016/679), participation was voluntary and could be withdrawn at any time without penalty. All participants were asked to provide informed consent before accessing the questionnaire. Adult participants indicated consent by selecting the consent checkbox on the first page and then proceeding to the survey. For underage participants, participation was permitted only after documented consent had been obtained in advance from their legal guardians, with the school also providing the required approval/permission for data collection. The information sheet stated that teachers would not have access to identifiable responses and that participation would not affect grades or standing.

Survey responses were collected via Google Forms with single-submission settings enabled and without IP logging. Raw data were exported to Microsoft Excel and stored in the researchers' office at the Liberal Arts Department of the American University of the Middle East, in encrypted storage located in Kuwait, with role-based, least-privilege access restricted to the researchers. A de-identified analytic dataset (with indirect identifiers minimized) was created for all analyses. Data will be retained until the publication of this study and then permanently deleted. Because recruitment occurred through teachers distributing the survey link in class settings, observations may be correlated within class or school.

Table 4. PU

N = 138 & 5% significance level		Estimated coefficients (standard errors)		
		Age	Education level	Computer literacy
Coefficients	Variables	R1	R2	R3
$\hat{a}_0$	Intercept	4.204 (0.322)	3.476 (0.619)	2.503 (0.331)
$\hat{a}_{PU1}$	PU1		0.121 (0.072)	-0.363 (0.046)
$\hat{a}_{PU2}$	PU2	0.211 (0.073)	0.427 (0.086)	
$\hat{a}_{PU3}$	PU3	-0.615 (0.082)	-0.378 (0.102)	
$\hat{a}_{PU4}$	PU4		-0.324 (0.081)	0.111 (0.055)
$\hat{a}_{PU5}$	PU5			0.183 (0.076)
$\hat{a}_{PU6}$	PU6		-0.352 (0.075)	-0.188 (0.063)
R square		0.507	0.646	0.579

Note. All the p-values < 0.05

Table 5. BI

N = 138 & 5% significance level		Estimated coefficients (standard errors)		
		Age	Education level	Computer literacy
Coefficients	Variables	R4	R5	R6
$\hat{\beta}_0$	Intercept	4.665 (0.243)	4.461 (0.423)	3.244 (0.233)
β_{UI1}	BI1		0.183 (0.068)	-0.218 (0.049)
$\hat{\beta}_{UI2}$	BI2	-0.827 (0.076)	-0.485 (0.081)	
$\hat{\beta}_{UI3}$	BI3	0.408 (0.074)		
$\hat{\beta}_{UI4}$	BI4			0.094 (0.048)
$\hat{\beta}_{UI5}$	BI5	-0.251 (0.042)	-0.313 (0.060)	
$\hat{\beta}_{UI6}$	BI6		-0.329 (0.106)	-0.487 (0.073)
R square		0.628	0.546	0.571

Note. All the p-values < 0.05

RESULTS

This section presents the results of the regression analyses exploring the relationship between students' PU and BI toward gamification and the influence of age, education level, and computer literacy. Six single-predictor models (R_1-R_6) were estimated using OLS. All models met standard diagnostic criteria, and no evidence of serial correlation was detected.

Perceived Usefulness of Gamification

The regression results indicate that PU varies systematically with age, education level, and computer literacy (**Table 4**). For PU, explained variance was highest in the education model (R^2 = .646), followed by computer literacy (R^2 = .579) and age (R^2 = .507), indicating consistently strong model fit across predictors.

Age showed a dual effect. Older learners tended to associate gamification with improved control and progress monitoring, while showing lower appreciation for features perceived as repetitive or competitive. Education level similarly produced mixed outcomes: students with higher qualifications valued gamification for enhancing efficiency and feedback yet rated repetitive tasks less positively.

Computer literacy emerged as an additional determinant of usefulness. Digitally proficient participants reported stronger endorsement of feedback- and progress-related features but were more critical of elements considered time-consuming or lacking instructional relevance. Overall, these findings suggest that PU is multidimensional and contingent upon both learner maturity and digital competence.

Intent to Use Gamified Activities

For BI, the single-predictor models showed moderate to strong explanatory power, with R^2 = .628 for age, R^2 = .546 for education, and R^2 = .571 for computer literacy (**Table 5**). Age exerted contrasting influences: older students were more willing to engage with feedback-oriented or collaborative tasks, whereas their interest declined for competitive or time-pressure formats.

A similar differentiation appeared across education levels. Students with higher qualifications expressed greater willingness to use gamification when it facilitated progress tracking and efficiency, yet less intention to participate in reward-only or leaderboard-based systems.

Table 6. F restricted-unrestricted test (5% significance level)

Regression	Dependent variable	Null hypothesis	F restricted-unrestricted	F critical	H_0
R1	Age	H_0: $\hat{\alpha}_{PU1} = \hat{\alpha}_{PU4} = \hat{\alpha}_{PU5} = \hat{\alpha}_{PU6} = 0$	1.38	2.04	No rejection
R2	Education level	H_0: $\hat{\alpha}_{PU5} = 0$	0.32	2.45	No rejection
R3	Computer literacy	H_0: $\hat{\alpha}_{PU2} = \hat{\alpha}_{PU3} = 0$	0.35	2.39	No rejection
R4	Age	H_0: $\hat{\beta}_{UI1} = \hat{\beta}_{UI4} = \hat{\beta}_{UI6} = 0$	0.90	2.25	No rejection
R5	Education level	H_0: $\hat{\beta}_{UI3} = \hat{\beta}_{UI4} = 0$	0.35	2.39	No rejection
R6	Computer literacy	H_0: $\hat{\beta}_{UI2} = \hat{\beta}_{UI3} = \hat{\beta}_{UI5} = 0$	0.90	2.25	No rejection

Table 7. DW test (5% significance level)

Regression	Null hypothesis	DW	d_L	d_U	H_0
R1	H_0: *No error autocorrelation*	1.84	1.79	1.68	No rejection
R2	H_0: *No error autocorrelation*	2.02	1.72	1.75	No rejection
R3	H_0: *No error autocorrelation*	1.94	1.71	1.76	No rejection
R4	H_0: *No error autocorrelation*	1.97	1.69	1.77	No rejection
R5	H_0: *No error autocorrelation*	1.94	1.71	1.76	No rejection
R6	H_0: *No error autocorrelation*	1.95	1.69	1.77	No rejection

Digital literacy again shaped intention. Participants with higher technological confidence showed stronger preference for clear, efficient, and feedback-driven gamified environments, while rejecting game layers that complicated task execution. These results confirm that acceptance of gamification is conditional on its pedagogical relevance rather than on novelty alone.

Model Validation

All F restricted-unrestricted tests indicated that the imposed constraints did not significantly reduce model fit, as none of the null hypotheses were rejected at the 5 % level (**Table 6** and **Table 7**). The DWn statistics ranged between 1.68 and 2.02, confirming the absence of autocorrelation and validating the use of ordinary least-squares estimators. These diagnostics ensure that the reported coefficients represent efficient and unbiased estimates of the predictors' effects.

Summary of Findings

Overall, attitudes toward gamification were generally positive, with baseline scores clustering around or above the midpoint of the scale. In both the PU and BI sections, single-predictor OLS models explained a significant portion of the variance: for usefulness, R^2 = .507 (age), .646 (education), .579 (computer literacy); for intention, R^2 = .628 (age), .546 (education), .571 (computer literacy). Model diagnostics indicated good fit throughout; DW ranged from 1.68 to 2.02 across all six models, showing no serial correlation. Restricted-unrestricted F tests revealed that constraints did not impair model fit. These results collectively support the internal consistency of the modelling approach.

Age effects were selective rather than uniform and varied by facet. For usefulness, age was positively associated with PU2 (b = 0.211) but negatively with PU3 (b = -0.615). Regarding intention, older learners showed higher endorsement of UI3 (b = 0.408) but lower endorsement of UI2 (b = -0.827) and UI5 (b = -0.251). This pattern indicates that maturation is associated with greater openness to certain gamified behaviors, while simultaneously leading to rejection of others—especially those perceived as competitive or time-consuming.

Education level, measured by English proficiency from Pre-FCE to CAE, showed varying effects across different items. In the usefulness block, higher education was positively linked to PU2 (b = 0.427) (and small for PU1) but negatively associated with PU3 (b = -0.378), PU4 (b = -0.324), and PU6 (b = -0.352). In the intention block, education was a positive predictor for UI1 (b = 0.183) and a negative predictor for UI2 (b = -0.485), UI5 (b = -0.313), and UI6 (b = -0.329). Overall, more experienced learners tend to be more selective: they are inclined to favor aspects that indicate progress or efficiency (e.g., PU2 and UI1) while rating lower those that might feel competitively stressful or offer limited instructional benefit (e.g., PU3/PU4/PU6 and UI2/UI5/UI6).

Computer literacy showed a distinct profile. Higher literacy was linked to greater agreement with PU4 (b = 0.111) and PU5 (b = 0.183), which likely relate to feedback density, progress visibility, or workflow clarity. Conversely, it was associated with less agreement on PU1 (b = -0.363) and PU6 (b = -0.188). In terms of

intention, literacy negatively correlated with UI1 (b = -0.218) and UI6 (b = -0.487), while the coefficient for UI4 was small and borderline (b = 0.094). The simplest interpretation is that digitally confident students are selective adopters: they value features that clarify progress and provide actionable feedback but dismiss generic or cumbersome layers that create friction with little apparent learning benefit.

Analyzing across predictors reveals two main insights. First, acceptance is multifaceted: the same predictor can boost certain items while reducing others within usefulness and intention, indicating that learners respond to different sub-aspects rather than a single overall construct. This multidimensionality aligns with expectations for a mixed-proficiency adolescent group engaging in various gamified activities. Second, the effects' directions can be understood through a common perspective: aspects that reflect informational feedback and progress signals tend to grow with age, proficiency, or digital skills, while those emphasizing individual competition or consuming time without clear benefits usually decline along these same dimensions.

Finally, the findings indicate a group that is generally favorable towards gamification but selective about which mechanics deserve ongoing engagement. Older, more skilled, and more digitally proficient learners tend to prefer designs that are efficient and rich in feedback, while being less receptive to overtly competitive or generic reward structures. The models explain a significant portion of the variance and meet standard diagnostics, enhancing the credibility of these meaningful conclusions.

DISCUSSION

This study examined Greek EFL learners' acceptance of classroom gamification through PU and BI, focusing on age, English proficiency, and computer literacy as moderators. Overall attitudes were positive: PU and BI scores hovered around or above the midpoint, and single-predictor models accounted for over half of the variance in each outcome ($R^2 \approx .51$-$.65$ for PU; .55-.63 for BI). This widespread optimism echoes previous research showing that learners generally welcome gamified activities and frequently request their continued use, especially in skills classes (Jie et al., 2023; Yazid et al., 2024). It also aligns with meta-analytic evidence that gamification consistently boosts motivation and engagement, although with more varied effects on achievement (Hamari et al., 2014; Sailer & Homner, 2020).

Simultaneously, the item-level regression results indicate that acceptance is selective rather than unconditional. Older and more capable learners were more likely to endorse items related to progress monitoring and feedback, but less inclined to support features that seemed repetitive, highly competitive, or time-consuming. This pattern refines the generally positive outlook reported in studies of quiz-based platforms such as Kahoot! and Quizizz, where learners reported high enjoyment and an improved classroom atmosphere (Wang & Tahir, 2020; Yunus & Tan, 2021). It suggests that, within an adolescent and emerging adult cohort, enthusiasm is high when gamification provides informational feedback and visible progress but diminishes when activities are perceived as overly competitive or lacking sufficient meaning, aligned with design-sensitive accounts of engagement in gamified learning (Park & Kim, 2021; Sailer & Sailer, 2020; Seaborn & Fels, 2015).

These age and proficiency gradients closely match the mechanisms predicted in the literature. Drawing on SDT and the TGL, the review argued that elements supporting competence, autonomy, and relatedness, such as progress indicators, team-based challenges, and timely feedback, are more likely to sustain PU and BI than simple points-badges-leaderboards packages (Landers, 2014; Nicholson, 2015; Sailer & Homner, 2020). In this study, older and more advanced learners indeed preferred features that signal efficiency and high-quality feedback, while disregarding those that seem to offer rewards without meaningful learning value. This supports the idea that PBL-only designs may suffice for short, focus-on-forms drills at lower levels (Nugraha & Sembiring, 2023; Wang & Tahir, 2020), but that more narrative, cooperative, and feedback-rich tasks are necessary to maintain acceptance among higher-proficiency learners engaged in complex production tasks (Seaborn & Fels, 2015; Utami et al., 2024).

The role of computer literacy in the current findings also aligns with earlier research. Learners who are more digitally confident reported higher PU for features that improve progress visibility and feedback density but showed lower PU and BI for items indicating generic or cumbersome game layers. This profile reflects Zainal's (2023) observation that digital literacy acts both as an enabler and a boundary condition in gamified

vocabulary learning: learners with higher digital skills can utilize sophisticated features but are also quick to recognize when an interface causes friction without clear pedagogical benefits. Within the TAM/UTAUT framework, the present data thus support the view that age, experience, and facilitating conditions influence the relationship between design and acceptance (Denden et al., 2022, Kashive & Mohite, 2023; Palmquist et al., 2021).

Finally, the selective nature of student acceptance in this study reflects the teacher-centered evidence reviewed earlier. Greek EFL teachers have reported both interest in and reservations about gamification, emphasizing concerns about feasibility and meaningful integration (Spathopoulou & Pitychoutis, 2024). The present learner data complement those findings: students are broadly positive, but they differentiate between gamified elements that genuinely support learning and those that mainly introduce competition or workload. This consistency suggests that both teachers and students prefer gamification when it aligns with clear instructional goals, offers adequate feedback, and considers age-appropriate social dynamics, rather than when it is adopted solely as a novelty.

In summary, this study supports the main argument in the literature that gamification can improve motivation and engagement in ELT (Jie et al., 2023; Sailer & Homner, 2020; Yazid et al., 2024), while also providing nuance about how adolescent and young adult EFL learners in a Greek context assess specific mechanics. The findings suggest that PU and BI are high but distinct, systematically influenced by age, proficiency, and digital literacy. Future research should go beyond acceptance outcomes to integrate similar item-level models with behavioral and achievement measures, in order to directly test the mediational pathways proposed by SDT and TGL and to identify under which design conditions positive attitudes lead to sustainable learning gains.

CONCLUSION AND RECOMMENDATIONS

The findings confirm that Greek EFL learners approach gamification with clear interest, yet they do so through evaluative filters shaped by age, English proficiency, and digital experience. PU and BI remain strong indicators of acceptance, but the item-level patterns demonstrate that learners distinguish sharply between mechanics that offer meaningful support and those that appear repetitive, competitive, or insufficiently aligned with instructional aims. In this sense, acceptance emerges not as a blanket approval of gamification but as a differentiated response to how specific elements mediate learning, motivation, and task demands.

Aligned with well-known theories like TAM/UTAUT and the motivational cues from SDT, the data show that cues focusing on progress, immediate feedback, and efficient task design are widely endorsed by learners. In contrast, features such as competitive rankings and rewards-only systems are viewed more cautiously, especially by older, more skilled, or digitally confident students. These results are similar to studies indicating that PBL-only approaches work well for quick retrieval practice but may not maintain engagement during longer, feedback-intensive tasks.

Overall, the findings suggest that gamification works best when it is a seamless part of teaching rather than just a simple motivational tool. Learners tend to respond well when game mechanics clarify, support autonomy, and are relevant to the instruction. However, they tend to lose interest if game features add pressure, increase social comparison, or lack useful feedback. This pattern of selective acceptance indicates that successful gamification depends not only on choosing the right features but also on understanding why those features fit the specific learners, tasks, and situations.

Recommendations

Based on the insights, three suggestions emerge for teachers, curriculum planners, and institutions:

- Prioritize feedback-rich and progress-visible mechanics. Elements such as task-level indicators, timely corrective feedback, and transparent scoring structures are consistently favored across age and proficiency groups. These mechanics promote competence and reduce ambiguity, particularly in mixed-level classes.
- Calibrate competitive and reward-based features. While younger learners may thrive under light competition, older or more advanced groups often interpret persistent rankings as unhelpful or

stressful. Team-based leaderboards or progress-banded visualizations can maintain engagement without heightening social comparison.

- Streamline gamified environments for digitally confident learners. Students with higher digital literacy tend to reject cumbersome or extrinsic layers that do not clearly advance learning. Implementations should therefore minimize unnecessary steps, reduce interface friction, and ensure that every mechanic has a visible instructional purpose.

Limitations

The study's cross-sectional design limits causal inference, and the reliance on self-reported acceptance measures restricts the ability to link perceptions to actual behavior or achievement. Future work should incorporate longitudinal or experimental designs and combine acceptance data with performance metrics to test the mediational pathways proposed in SDT and TGL. Overall, the study supports a nuanced view of gamification: broadly welcomed, selectively evaluated, and most effective when pedagogically aligned with learner needs and task structure.

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