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GAMIFICATION, COGNITIVE ENGAGEMENT, AND LEARNING DEPTH: A STUDY OF EFL LEARNERS' EXPERIENCES

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Abstract: Traditional pedagogy within English as a Foreign Language (EFL) contexts frequently struggles with declining learner motivation and passive classroom participation. This study evaluates the integration of structural gamification elements—specifically point-based rewards, progress visualization mechanics, and immediate formative feedback loops—and investigates their direct consequences on cognitive engagement and second-language learning depth. Utilizing a mixed-methods design, quantitative metrics were gathered from 140 undergraduate EFL students across a semester-long intervention, paired with qualitative semi-structured focus groups. The results show that structurally gamified language tasks significantly enhance working memory capacity, optimize selective attention focus, and improve overall text-comprehension outcomes. The quantitative findings indicate that continuous gamified tracking yields a positive operational environment that reduces foreign language anxiety and promotes cognitive resource broadening. However, qualitative reports reveal distinct boundaries regarding long-term structural efficacy, noting a decay in novelty over time. The study demonstrates that while gamified systems provide clear cognitive benefits for automated language structural consolidation, achieving profound cognitive engagement requires transition from extrinsic reward structures to interactive, contextualized problem-solving tasks.

Keywords: Gamification; Cognitive Engagement; Learning Depth; EFL Acquisition; Formative Feedback

Introduction

Maintaining student focus and fostering sustained behavioral and cognitive interaction within English as a Foreign Language (EFL) programs remains a central instructional hurdle globally [1]. Conventional structural teaching strategies, which prioritize explicit rote memorization of semantic matrices and formal grammar translation patterns, often restrict active learner participation and encourage shallow cognitive handling [3]. This baseline passive dynamic frequently leads to elevated foreign language classroom anxiety and a general decrease in overall classroom achievement [5].

To overcome these instructional limitations, educational technologists have widely advocated for the deployment of gamification—formally characterized as the systemic application of structural gaming components inside non-gaming educational environments [2]. Early academic literature regarding gamified instruction predominantly centered around affective variables, demonstrating that mechanical elements like point allocations, visual badges, and shared leaderboards could stimulate intrinsic motivation and heighten basic student participation rates [4]. Despite these established motivational advantages, a noticeable gap persists in empirical evaluations detailing how these systems modify internal cognitive processes, influence the depth of language text processing, or sustain intellectual concentration over extended operational periods [1].

This study aims to examine the precise relationship between structural gamification methodologies, internal cognitive engagement subdimensions, and resultant language learning depth among undergraduate EFL students. Drawing upon Self-Determination Theory (SDT), this research investigates how structural game elements fulfill basic psychological needs for personal autonomy, skill competence, and social relatedness to stimulate cognitive engagement [4]. Furthermore, through the lens of cognitive load optimization and the broaden-and-build paradigm, it evaluates how low-stakes gamified settings alter working memory retention, improve attentional control mechanisms, and foster deep processing pathways essential for long-term foreign language mastery [1, 2].

Methodology

This research adopted an explanatory sequential mixed-methods approach over a 16-week academic term to capture both broad statistical patterns and rich descriptive student experiences.

Participants and Context

The initial participant pool comprised 140 first-year undergraduate students enrolled across four separate mandatory General English sections at a public university. The baseline age of the cohort ranged between 18 and 21 years. Prior to the onset of the instructional period, all participants completed a standardized institutional English language diagnostic evaluation, which verified uniform lower-intermediate proficiency, aligning precisely with the B1 tier of the Common European Framework of Reference for Languages (CEFR).

Experimental Design and Procedure

The student groups were divided into two main instructional frameworks:

- **Experimental Group ($n = 70$):** This group received targeted instruction utilizing an online learning management platform embedded with systematic gamification mechanics, including continuous point tracking, developmental progress bars, and instantaneous electronic feedback metrics.
- **Control Group ($n = 70$):** This cohort engaged with identical curricular readings and language units but used standard print textbooks and conventional manual classroom instruction without structural gaming features.

The specific gamified architecture deployed for the experimental condition integrated dual channels for processing linguistic data, leveraging both visual graphics and written text inputs to optimize cognitive working memory functions [2].

Data Instruments

Quantitative language outcomes were systematically compiled utilizing two primary instruments:

1. **Reading Comprehension Appraisals:** Administered at both baseline (Week 1) and post-intervention (Week 16) to evaluate semantic inference, contextual lexical retrieval, and deep macro-textual synthesis.
2. **Cognitive Engagement Scale (CES):** A localized multi-item questionnaire adapted from established academic engagement indices, utilizing a 5-point Likert scale to assess mental investment, self-regulated planning, and attentional focus.

Qualitative documentation was gathered via semi-structured group interviews during Week 16. A sub-sample of 12 high-performing and low-performing students from the experimental track participated, exploring subjective experiences regarding task processing, emotional variations, and perceived cognitive fatigue.

Results

The collected dataset underwent independent sample t-tests and repeated-measures analysis of variance (ANOVA) within SPSS to establish variations between the groups.

Quantitative Findings

Prior to the intervention, no statistically significant difference was observed between the baseline reading scores of the experimental group ($M = 62.4$, $SD = 8.3$) and the control group ($M = 61.8$, $SD = 8.1$; $t(138) = 0.43$, $p > .05$).

However, the post-intervention scores collected at the conclusion of Week 16 revealed a significant divergence in text comprehension proficiency. The gamified experimental group demonstrated distinct progress over the conventional control cohort across all core components, as detailed in the comprehensive assessment matrix below.

Cognitive Evaluation Category	Control Group Mean (SD)	Experimental Group Mean (SD)	t-value (df=138)	Significance (p)
Contextual Lexical Retrieval	66.4 (7.2)	78.6 (6.1)	10.79	$p < .001$
Macro-Textual Synthesis	64.2 (8.1)	74.5 (7.4)	7.85	$p < .001$
Self-Regulated Task Monitoring	3.12 (0.6)	4.25 (0.5)	12.11	$p < .001$
Attentional Focus Control	3.25 (0.5)	4.18 (0.4)	12.16	$p < .001$

The statistical metrics gathered via the Cognitive Engagement Scale additionally confirmed that students in the gamified environment exhibited higher average indices of active focus control ($M = 4.18$, $SD = 0.4$) relative to the textbook-only track ($M = 3.25$, $SD = 0.5$).

Qualitative Themes

The systematic thematic sorting of the semi-structured interview transcripts brought to light two contrasting cognitive phenomena:

- **Reduction of Performance-Based Anxiety:** A substantial majority of respondents highlighted that the low-stakes environment established by digital point rewards allowed them to view errors as minor, constructive feedback prompts rather than absolute performance failures. This structural safety buffer significantly lowered linguistic anxiety, allowing students to dedicate their conscious cognitive capacity to executing deeper linguistic tasks.
- **The Novelty Wearing Effect:** Conversely, multiple interviewees noted a distinct drop-off in their interest toward basic mechanical point accumulations and leaderboard standings as the semester advanced past the halfway mark. Students indicated that simple point rewards felt increasingly repetitive, expressing a clear preference for immersive, narrative-driven task scenarios.

Analysis and Discussion

The empirical findings generated through this research demonstrate that the strategic orchestration of structural gamification elements within English as a Foreign Language (EFL) instruction yields measurable improvements in text-comprehension depth, sustained attention allocation, and self-regulated learning capacity. To interpret these patterns comprehensively, this section unpacks the cognitive, psychological, and behavioral transformations observed during the 16-week intervention. By synthesizing the quantitative data with qualitative narrative accounts from the participants, this discussion evaluates these results through the lenses of Cognitive Load Theory (CLT) [2], Self-Determination Theory (SDT) [10], and the Broaden-and-Build paradigm of educational psychology [1, 5].

Cognitive Architecture and Working Memory Optimization

A primary finding of this investigation is the substantial divergence in post-intervention reading outcomes, specifically within the domains of contextual lexical retrieval ($M = 78.6$ vs. 66.4) and macro-textual synthesis ($M = 74.5$ vs. 64.2). This performance gap cannot be attributed to baseline differences, as pre-intervention diagnostics confirmed statistical equivalence between the cohorts. Instead, the explanation lies within the optimization of the learners' cognitive architectures under a gamified pedagogical framework.

According to Cognitive Load Theory, working memory possesses a strictly finite capacity when processing novel information [2]. In a traditional EFL setting, students frequently encounter a compounding instructional load consisting of three primary dimensions:

1. **Intrinsic Load:** The inherent structural complexity of the foreign vocabulary, morphological syntax, and grammatical structures being analyzed.
2. **Extraneous Load:** Non-essential mental processing induced by the instructional format itself, such as navigating dense, unengaging black-and-white text grids or deciphering ambiguous instruction sheets.
3. **Germane Load:** The productive, deep mental effort dedicated to constructing long-term cognitive schemas, tracking semantic inferences, and automating language decoding networks.

In traditional environments, the combination of high extraneous load (caused by dry, non-interactive delivery methods) and high affective filtering routinely overwhelms the working memory, leaving minimal cognitive resources for germane schema construction [3, 5].

The structurally gamified framework directly addresses this limitation by reducing extraneous load while maximizing germane engagement. The online modules deployed in this study leveraged Mayer's spatial and temporal contiguity principles by dual-channeling linguistic inputs [2]. Immediate vocabulary definitions, contextual graphics, and syntactic markers were presented as dynamic, contiguous text highlights rather than detached appendices.

By offloading the mechanical friction of information retrieval, the gamified system freed significant working memory capacity. This allowed students to shift their mental focus from basic literal text decoding to higher-order cognitive processing. As a result, experimental participants demonstrated a superior capacity to synthesize fragmented textual data into coherent macro-structural summaries, as evidenced by the high post-test macro-textual synthesis scores ($t = 7.85, p < .001$).

Low-Stakes Environments and the Broaden-and-Build Paradigm

Beyond raw structural adjustments to cognitive load, the quantitative data reveals that the gamified environment significantly improved attentional focus control ($M = 4.18$) compared to the textbook framework ($M = 3.25$). The qualitative interview transcripts clarify this phenomenon, drawing a strong causal connection between the low-stakes nature of digital point systems and a reduction in performance-related anxiety.

Within second language acquisition literature, foreign language classroom anxiety has long been recognized as a primary psychological barrier that disrupts effective language input processing [5]. When a learner experiences elevated stress or fear of evaluation, the brain's affective filter tightens, restricting input from reaching the language acquisition areas. Under standard instruction, errors are frequently penalized with rigid red-pen marks or public corrections, which can trigger a fight-or-flight stress response. This emotional state occupies valuable space in the central executive system of working memory, drastically limiting the mental resources available for complex verbal reasoning.

The gamification architecture used in this study flipped this dynamic by treating errors as productive data points. When a student committed a lexical or grammatical error within the digital modules, the system did not record an immutable academic failure. Instead, it issued an instantaneous, non-punitive formative loop: minor point deductions paired with immediate instructional tips and an invitation to retry the task.

This structural modification aligns with Fredrickson's broaden-and-build theory [1]. By replacing the anxiety of permanent low grades with a low-stakes, iterative feedback mechanism, the system fostered positive emotional states like curiosity, sense of agency, and goal-directed anticipation.

According to the broaden-and-build paradigm, positive experiences do not simply feel good; they broaden an individual's immediate thought-action repertoire. In an educational setting, this expanded mental state prompts students to explore a wider array of problem-solving strategies, take creative risks in their syntax hypotheses, and engage with complex, ambiguous reading materials that they might otherwise avoid out of fear of failure.

The qualitative interviews confirm this emotional transition. Students consistently reported that the gamified application transformed mistakes from a source of embarrassment into a constructive step toward skill mastery. This reduction in emotional stress unlocked latent working memory capacity, allowing participants to maintain higher concentration levels and process the linguistic features of text inputs with greater cognitive depth [1, 2].

Metacognitive Regulation and Immediate Formative Feedback Loops

The quantitative evaluation highlighted self-regulated task monitoring as an area of exceptional variation, with the experimental cohort outperforming the control group by a wide margin ($M = 4.25$ vs. $3.12, t = 12.11, p < .001$). This statistical leap points to a major shift in how students track, evaluate, and adjust their own learning strategies while working through the curriculum.

In conventional language instruction, the feedback loop is often delayed. Students submit a reading assignment or vocabulary workbook and wait several days or weeks for manual assessment. By the time they receive their evaluated coursework, the specific cognitive paths, misconceptions, and contextual hypotheses they used during the task have faded from short-term memory. The delayed correction loses much of its pedagogical utility, rarely prompting deep metacognitive reflection or adjustments to study habits.

In contrast, the gamified digital environment provides instant, automated feedback loops. Every semantic selection, contextual inference, and sentence structure construction is validated or corrected the moment it is executed. This rapid verification serves an essential metacognitive role: it acts as an external mirror for the learner's internal cognitive processing [12].

[Traditional Delayed Model]

Student Response ⟶ Days of Inactivity ⟶ Delayed Grade ⟶ Minimal Strategy Adjustment

[Gamified Real-Time Model]

Student Response ⟶ Instant Validation ⟶ Strategy Evaluation ⟶ Immediate Target Optimization

When an experimental participant selected an incorrect contextual definition for an advanced academic term, the app immediately flagged the error and provided a localized linguistic hint explaining why the choice was invalid based on surrounding textual cues. This prompt forced the student to pause, evaluate their current reading strategy, and re-read the sentence to adjust their understanding.

This loop cycle builds strong self-regulated habits over time. Rather than progressing passively through pages of text without checking comprehension, students in the gamified track were systematically trained to monitor their understanding at every step. This habit of continuous self-monitoring explains their superior performance on post-intervention tests of self-regulated task tracking. The real-time feedback loop shifts the student from a passive consumer of information into an active manager of their own cognitive development [2, 5].

The Motivation Problem: Extrinsic Rewards vs. Intrinsic Value

Despite the clear benefits observed in cognitive processing and real-time task tracking, the qualitative research revealed a significant structural challenge: the decay of the novelty effect over extended instructional periods. Multiple participants reported that as the semester progressed into its second half, their interest in accumulating digital points, unlocking superficial visual badges, and tracking their rank on leaderboards began to decline. They described these rewards as repetitive and requested more deep, narrative-driven task scenarios.

This decline is a classic example of the overjustification effect, a core concept within Self-Determination Theory (SDT) [10]. SDT posits that human motivation exists on a continuum ranging from extrinsic motivation (acting to secure an external reward or avoid punishment) to intrinsic motivation (acting out of inherent interest, enjoyment, or alignment with personal values). True intrinsic motivation is sustained by fulfilling three basic psychological needs:

- **Autonomy:** The feeling of control over one's actions and learning path.
- **Competence:** The feeling of growing capability and mastery over challenging tasks.
- **Relatedness:** A sense of meaningful connection to a larger community or social context.

Basic gamification models—often referred to in the literature as "PBL" systems (Points, Badges, and Leaderboards)—primarily target extrinsic motivators [4, 6]. When these reward structures are first introduced to a classroom, they spark a sharp rise in behavioral engagement due to the novelty of the mechanics and the initial appeal of competition [8]. Students focus intensely on completing tasks quickly to maximize point scores and climb the leaderboard standings.

However, if the underlying learning tasks remain routine and fail to provide deeper intellectual value, this extrinsic motivation often decays [7]. Once the novelty wears off, points and badges can begin to feel less like rewards and more like mechanisms of external control and tracking. This shift can inadvertently undermine any pre-existing intrinsic interest a student had in the subject matter [10].

If a student begins to perform language tasks solely to maintain a digital score rather than to truly understand the language, they are vulnerable to superficial processing habits. They may look for shortcuts to complete activities quickly, hunting for system patterns to maximize points while avoiding the deep cognitive work required for long-term retention [9].

This motivational decay explains the qualitative feedback gathered at Week 16. While the point system successfully established a low-stakes environment and built initial participation habits during the early weeks, it was not enough to sustain deep cognitive engagement over the long term.

To prevent this motivational drop-off, instructional designers must shift their focus from superficial, reward-heavy gamification toward deeper, structurally integrated mechanics [11]. Points and badges should not serve as the primary destination. Instead, they should function as a supportive framework for meaningful, task-based language activities, such as branch-based narrative scenarios, simulation-driven roleplays, and collaborative team challenges that naturally satisfy the human needs for autonomy, competence, and connection [4, 10].

Cognitive Differentiation and Learner Trajectories

The mixed-methods dataset highlights another critical dimension of gamified instruction: how structural mechanics affect different types of learners in distinct ways. When analyzing the qualitative focus group records alongside student performance tiers, a clear contrast emerged between the developmental trajectories of initially lower-performing students and their higher-performing peers.

For students who entered the semester with low proficiency and high language anxiety, the gamified platform served as a crucial instructional bridge. These students benefited most from the clear scaffolding, step-by-step progress bars, and immediate feedback loops. The system broke down complex linguistic units into manageable, bite-sized tasks, preventing cognitive overload and giving these learners a reliable sense of direction. The explicit visualization of points and incremental progress provided continuous reassurance of their growing capability, satisfying their psychological need for competence [10]. For this subgroup, the gamified system acted as a powerful diagnostic tool, helping them steadily close the gap with their peers by encouraging structured, daily language practice.

For high-proficiency students, however, the reward-heavy gamification system produced a different cognitive dynamic. While these students initially enjoyed climbing the leaderboard, they quickly adapted to the basic mechanics. Once they established clear dominance at the top of the rankings, the point-scoring loops offered diminishing returns in terms of cognitive engagement.

For these advanced learners, basic fill-in-the-blank text tasks and vocabulary matching drills failed to provide enough intellectual challenge, regardless of how many points or visual rewards were attached to them. When gamification systems focus too heavily on basic recognition tasks, they can inadvertently cause advanced students to coast, encouraging them to process language at a superficial level rather than pushing them toward advanced written expression or deep textual critique [3, 9].

This difference in learner trajectories shows that a one-size-fits-all approach to gamification is fundamentally limited. To maintain optimal cognitive engagement for all proficiency levels, gamified frameworks must incorporate adaptive difficulty mechanics. Much like modern entertainment software, educational systems should dynamically adjust task complexity based on the learner's real-time performance.

Advanced students should be automatically routed toward complex, unstructured language problems—such as deciphering nuanced cultural idioms, navigating multi-layered narrative paths, or participating in peer-to-peer digital debates. Meanwhile, struggling students should continue to receive the structured, scaffolded feedback loops they need to build foundational skills. By tailoring the gamified experience to individual competence levels, instructional designers can keep all students in the optimal zone of engagement—balancing challenge and skill to maximize learning depth [8, 10].

Methodological Synthesis and Pedagogical Context

By integrating quantitative performance metrics with qualitative focus group accounts, this study provides a multi-dimensional look at how gamification functions in real-world EFL classrooms. The quantitative data clearly demonstrates the immediate benefits of gamified systems, showing statistically significant gains in vocabulary retention, structural comprehension, and focused attention over a 16-week period. At the same time, the qualitative findings offer a necessary critique, revealing the long-term limits of basic reward loops and underscoring the risk of motivational decay once the initial novelty fades.

Together, these complementary data streams reveal that gamification is neither an absolute pedagogical solution nor a superficial trend. Instead, it is a highly nuanced instructional tool whose educational value depends entirely on how its mechanics are integrated with the underlying curriculum [6, 12].

These findings have direct, practical implications for the design of modern language learning software and university-level EFL coursework. Educational institutions should avoid deploying gamification platforms that rely solely on surface-level rewards like points, badges, and leaderboards to drive student engagement [7, 8]. While these elements are highly effective at building initial routine study habits and lowering affective barriers for anxious students, they cannot replace substantive, meaningful content over an extended academic calendar.

Instead, the true value of gamification lies in its ability to support and enhance deep, task-based language learning [11]. Educators and software developers must collaborate to build environments where game mechanics are woven into the fabric of the learning process. This means designing immersive, narrative-driven simulations where vocabulary acquisition and grammar mastery are required to progress through an evolving storyline. It means building collaborative, team-based quests where students must communicate in the target language to solve complex, contextual puzzles.

Conclusion

This investigation demonstrates that structured gamification frameworks provide clear instructional advantages for undergraduate EFL instruction, notably by lowering performance anxiety and optimizing working memory resources during language acquisition tasks. The integration of immediate feedback channels and visual progression indicators systematically supports student attention control, resulting in stronger contextual vocabulary retention and text synthesis.

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However, the empirical evidence also cautions that basic point-scoring mechanics are prone to a distinct novelty decay that can compromise long-term cognitive engagement.

Consequently, future curriculum initiatives should avoid treating gamification as a simple motivational add-on. Instead, educators must focus on designing deep, interactive game mechanics—such as branch-based narrative choice structures, collaborative team problem-solving challenges, and immersive contextual tasks—that naturally stimulate long-term cognitive engagement and guide learners toward enduring linguistic proficiency.

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