Differential effects of game-based learning platforms on ESL university students: a comparative analysis of Kahoot, Jeopardy, and Bamboozle through the lens of Self-Determination Theory

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Abstract

Game-based learning platforms have emerged as transformative tools in English as a Second Language (ESL) education, yet comparative analyses of their differential effects remain scarce. This mixed-methods study investigates Turkish university students' ($N = 45$) attitudes toward three prominent platforms – Kahoot, Jeopardy, and Bamboozle – through the theoretical framework of Self-Determination Theory (SDT). Employing a convergent parallel design, we collected quantitative data via validated questionnaires measuring motivation, engagement, vocabulary/grammar reinforcement, and stress reduction, complemented by qualitative insights from semi-structured interviews. Kruskal-Wallis H tests revealed nuanced platform-specific effects: Kahoot excelled in fostering intrinsic motivation (91% agreement) and participation (87%), Jeopardy provided structured content review with moderate engagement (82% motivation), while Bamboozle uniquely addressed emotional well-being (84% stress relief). Mann-Whitney U tests indicated no significant gender or proficiency-based differences, suggesting universal applicability across diverse learner profiles. Structural equation modeling revealed that platform choice mediated the relationship between autonomy support and learning outcomes ($\beta = 0.42$, $p < .001$). These findings extend SDT by demonstrating how different gamification mechanics satisfy distinct psychological needs, with implications for adaptive learning design. The study contributes to the growing body of Computer-Assisted Language Learning (CALL) literature by providing empirical evidence for strategic platform selection based on pedagogical objectives and learner needs.

Keywords

game-based learning, ESL education, Self-Determination Theory, Kahoot, comparative analysis, motivation, digital pedagogy

1. Introduction

The integration of digital game-based learning (DGBL) platforms in language education represents a paradigm shift from traditional pedagogical approaches to technology-enhanced, learner-centered environments [1, 2]. As educational institutions globally embrace digital transformation, understanding the differential effects of various gamification platforms becomes crucial for optimizing language learning outcomes [3]. While substantial research has examined individual platforms, particularly Kahoot [4, 5], comparative analyses that illuminate platform-specific affordances remain notably absent from the literature.

The Turkish higher education context presents a unique setting for investigating DGBL effectiveness, characterized by rapid technological adoption alongside traditional pedagogical values [6]. Turkish ESL learners face distinct challenges, including limited authentic language exposure and motivation maintenance in formal educational settings. This study addresses these challenges by examining how different game mechanics align with learner needs and psychological states.

CTE 2024: 12th Workshop on Cloud Technologies in Education,
co-located with the 6th International Conference on History, Theory and Methodology of Learning (ICHTML 2025),
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Self-Determination Theory [7] provides a robust theoretical framework for understanding motivation in gamified learning environments. SDT posits that intrinsic motivation flourishes when three basic psychological needs are satisfied: autonomy (the need for volition and self-direction), competence (the need for effectiveness and mastery), and relatedness (the need for connection and belonging). Different gamification platforms may differentially support these needs through their unique design features and interaction patterns [8].

2. Theoretical framework and literature review

2.1. Self-Determination Theory in digital language learning

Self-Determination Theory offers a multidimensional perspective on motivation that transcends the traditional intrinsic-extrinsic dichotomy [7]. In digital learning environments, SDT's relevance intensifies as technology mediates the satisfaction of psychological needs in novel ways [9]. Recent meta-analyses demonstrate that gamification elements can enhance autonomous motivation when aligned with SDT principles [10].

The autonomy dimension manifests in gamified platforms through choice architecture and personalization features. Heilman et al. [11] found that allowing learners to select topics based on personal interest significantly enhanced vocabulary acquisition, suggesting that even minimal autonomy support can trigger motivational benefits. Competence needs are addressed through progressive difficulty, immediate feedback, and achievement systems that scaffold learning [12]. Relatedness emerges through collaborative features, leaderboards, and social comparison mechanisms, though these can produce differential effects based on individual differences [13].

Critically, SDT suggests that external regulations (such as points and badges) can be internalized along a continuum, potentially supporting or undermining intrinsic motivation depending on implementation [14]. This theoretical nuance is particularly relevant for understanding how different platforms' reward structures influence sustained engagement.

2.2. Comparative analysis of game-based learning platforms

Kahoot's dominance in educational gamification research reflects its widespread adoption and distinctive features [2]. The platform's synchronous, competitive format creates what Licorish et al. [4] term "energized engagement" – a heightened state of attention and participation driven by time pressure and social comparison. Meta-analytic evidence suggests moderate to large effect sizes for Kahoot on learning outcomes ($d = 0.77$), with particularly strong effects on motivation ($d = 0.96$) and retention ($d = 1.49$) [3].

However, the competitive element produces paradoxical effects. While competition enhances engagement for some learners, it can induce anxiety and surface-level processing in others [15]. Alawadhi and Abu-Ayyash [16] found that Emirati students appreciated Kahoot's motivational impact but reported stress from the speed-based scoring system. This tension highlights the importance of considering individual differences in competitive orientation when implementing Kahoot.

Recent innovations in Kahoot's design, including team modes and formative assessment features, address some limitations while maintaining core engagement mechanics [17]. The platform's effectiveness appears contingent on pedagogical integration rather than mere technological adoption [18].

Digital adaptations of Jeopardy leverage familiar game show mechanics to create engaging review sessions [19]. Unlike Kahoot's rapid-fire format, Jeopardy emphasizes strategic thinking through point wagering and category selection. This design affords deeper cognitive processing but may reduce the immediate excitement associated with time-pressured responses.

Limited empirical research on educational Jeopardy implementations represents a significant gap. Available studies suggest moderate effectiveness for content review and collaborative learning [20], but comparative analyses with other platforms remain scarce. The platform's potential for fostering metacognitive skills through strategic decision-making warrants further investigation.

Bamboozle's emergence as an educational platform reflects evolving preferences for customizable, collaborative gaming experiences [21]. The platform's team-based structure and varied game modes offer flexibility absent in more rigid platforms. Preliminary evidence suggests Bamboozle effectively reduces anxiety while maintaining engagement, potentially serving learners who find competitive formats overwhelming.

The platform's relative novelty in academic literature limits comprehensive evaluation. Initial studies indicate promise for vocabulary acquisition and collaborative skill development, but systematic comparisons with established platforms are needed to validate these observations.

2.3. Motivational dynamics in ESL contexts

Language learning motivation exhibits unique characteristics that distinguish it from general academic motivation [7]. The L2 Motivational Self System, comprising the Ideal L2 self, Ought-to L2 self, and L2 Learning Experience, provides a framework for understanding how gamification influences language-specific motivational processes [22].

Recent research demonstrates complex relationships between teacher support, peer support, and L2 engagement, with gamification potentially mediating these relationships [23, 24]. The social dimension of language learning makes collaborative and competitive game elements particularly salient. Kim and Kim [25] found that online community engagement through gamified platforms significantly influenced ESP students' motivational orientations, with differential effects based on proficiency levels.

Cultural factors also shape motivational responses to gamification. Asian educational contexts, characterized by collectivist values and examination pressure, may produce distinct patterns of engagement with competitive versus collaborative game mechanics [26, 27]. Understanding these cultural nuances is essential for interpreting findings from specific national contexts.

2.4. Research gaps and study objectives

Despite extensive research on individual platforms, several critical gaps persist:

1. *Comparative empirical studies*: Direct comparisons of multiple platforms within identical pedagogical contexts remain rare [28].
2. *Theoretical integration*: Few studies explicitly connect platform features to established motivational theories [29].
3. *Individual differences*: The moderating role of learner characteristics on platform effectiveness requires systematic investigation [30].
4. *Emotional dimensions*: Beyond motivation and achievement, platforms' effects on stress, anxiety, and well-being deserve attention [31].

This study addresses these gaps through a theoretically grounded, comparative analysis of three platforms, examining both cognitive and affective outcomes while considering individual difference variables.

3. Research questions

Building on identified gaps and theoretical foundations, this study addresses:

RQ1: What are ESL university students' differential attitudes toward Kahoot, Jeopardy, and Bamboozle in language learning contexts?

RQ2: How do the three platforms differ in their effects on motivation, vocabulary/grammar reinforcement, stress relief, and participation, as understood through Self-Determination Theory?

RQ3: To what extent do gender and language proficiency moderate platform preferences and perceived effectiveness?

RQ4: What platform-specific features emerge as critical for satisfying learners' psychological needs for autonomy, competence, and relatedness?

4. Methodology

4.1. Research design

This study employed a convergent parallel mixed-methods design [32], integrating quantitative and qualitative data to provide comprehensive insights into platform effects. The design's strength lies in triangulation, allowing validation of quantitative patterns through qualitative exploration of underlying mechanisms. Data collection occurred simultaneously, with integration during the interpretation phase.

4.2. Participants and context

Participants comprised 45 students (19 males, 26 females) enrolled in a mandatory English preparatory program at two Turkish state universities during the 2024–2025 academic year. Ages ranged from 18 to 22 years ($M = 19.4$, $SD = 1.2$). The sample represented diverse academic disciplines: Engineering (40%), Social Sciences (33%), and Health Sciences (27%). Language proficiency levels, assessed via institutional placement tests aligned with the Common European Framework of Reference (CEFR), included A2 (31%), B1 (42%), and B2 (27%) levels.

Convenience sampling was employed due to institutional access constraints [32]. While limiting generalizability, this approach facilitated in-depth investigation within authentic educational settings. Post-hoc power analysis indicated adequate power (0.82) for detecting medium effect sizes with the obtained sample.

4.3. Intervention design

The intervention spanned eight weeks, with each platform implemented for concentrated two-week periods followed by a comparison week. This rotation design minimized order effects while allowing sufficient exposure for attitude formation. Each platform session lasted 20 minutes, integrated into regular 90-minute classes twice weekly.

Platform implementation followed standardized protocols:

- **Kahoot**: Quiz games covering weekly vocabulary and grammar topics, utilizing both individual and team modes.
- **Jeopardy**: Review sessions with categories spanning difficulty levels, implemented via Jeopardy-Labs.
- **Bamboozle**: Varied game modes including matching, multiple choice, and open-ended questions, emphasizing collaboration.

Content alignment across platforms ensured comparability, with identical learning objectives targeted through platform-specific mechanics.

4.4. Data collection instruments

4.4.1. Quantitative measures

The primary instrument adapted validated scales from Wei and Moyer [33] and Licorish et al. [4], comprising 40 Likert-scale items (1 = strongly disagree, 5 = strongly agree) measuring four dimensions per platform:

1. **Motivational impact** (10 items, $\alpha = 0.89$): "Using [Platform] increases my desire to learn English".
2. **Learning effectiveness** (10 items, $\alpha = 0.87$): "[Platform] helps me remember vocabulary better".
3. **Engagement quality** (10 items, $\alpha = 0.91$): "I feel fully absorbed when using [Platform]".
4. **Emotional response** (10 items, $\alpha = 0.85$): "[Platform] reduces my anxiety about making mistakes".

Confirmatory factor analysis supported the four-factor structure ($\chi^2/df = 2.14$, CFI = 0.93, RMSEA = 0.06), indicating acceptable model fit.

4.4.2. Qualitative measures

Semi-structured interviews with 12 purposefully selected participants (representing high, medium, and low engagement levels) explored experiences in depth. The interview protocol, developed through expert consultation and pilot testing, addressed:

- Platform-specific experiences and preferences.
- Perceived learning benefits and challenges.
- Emotional responses and stress levels.
- Suggestions for improvement.

Interviews lasted 30–45 minutes, were conducted in participants' preferred language (Turkish or English), and were audio-recorded with consent.

4.5. Data analysis procedures

4.5.1. Quantitative analysis

Statistical analyses employed SPSS 28.0 and AMOS 26.0, following a hierarchical approach:

1. Descriptive statistics characterized response distributions and identified outliers.
2. Reliability analysis confirmed scale internal consistency.
3. Normality testing (Shapiro-Wilk) indicated non-normal distributions, justifying non-parametric approaches.
4. Kruskal-Wallis H tests examined platform differences across dimensions.
5. Mann-Whitney U tests explored gender effects.
6. Effect sizes (Cohen's d and r) quantified practical significance.
7. Structural equation modeling tested mediational pathways between SDT constructs and outcomes.

4.5.2. Qualitative analysis

Interview transcripts underwent thematic analysis following Cohen et al. [32] framework:

1. Familiarization through repeated reading.
2. Initial coding using both inductive and deductive approaches.
3. Theme development through code clustering.
4. Theme refinement via constant comparison.
5. Final theme definition and exemplar selection.

Two independent coders achieved substantial inter-rater reliability (Cohen's $\kappa = 0.83$), with discrepancies resolved through discussion.

4.6. Ethical considerations

The study received institutional ethics approval. Participants provided informed consent, with assurances of confidentiality and voluntary participation. Platform exposure formed part of regular curriculum, minimizing ethical concerns about differential treatment.

5. Results

5.1. RQ1: Differential student attitudes across platforms

Table 1 presents aggregated attitude scores across platforms, revealing distinct preference patterns.

Kahoot emerged as the most positively perceived platform, though differences were modest.

Analysis of specific dimensions revealed platform strengths and limitations (table 2).

Kahoot dominated motivational and engagement dimensions, while Bamboozle excelled in emotional support. Jeopardy showed consistent moderate scores without distinctive strengths.

Table 1
Overall attitude scores by platform.

Platform	Mean	SD	Median	IQR	Preference rank
Kahoot	4.12	0.68	4.20	0.85	1
Bamboozle	3.89	0.74	3.95	0.92	2
Jeopardy	3.71	0.81	3.75	1.05	3

Table 2
Mean scores by platform and dimension.

Dimension	Kahoot	Jeopardy	Bamboozle
Motivation	4.31 (0.72)	3.82 (0.89)	3.95 (0.78)
Learning effectiveness	4.05 (0.81)	3.77 (0.93)	3.68 (0.86)
Engagement quality	4.18 (0.69)	3.64 (0.97)	3.89 (0.83)
Emotional response	3.92 (0.94)	3.61 (1.02)	4.14 (0.71)

Note: Standard deviations in parentheses.

5.2. RQ2: Platform effects through SDT lens

Structural equation modeling revealed differential autonomy support across platforms (figure 1). Kahoot's limited choice architecture ($\beta = 0.28$, $p < .05$) contrasted with Bamboozle's flexibility ($\beta = 0.51$, $p < .001$).

All platforms supported competence through feedback mechanisms, though with varying effectiveness. Kahoot's immediate feedback strongly predicted perceived competence ($\beta = 0.61$, $p < .001$), while Jeopardy's strategic elements appealed to higher-proficiency learners.

Social dynamics varied markedly across platforms. Kahoot's competitive element produced mixed effects on relatedness, while Bamboozle's collaborative structure consistently fostered connection.

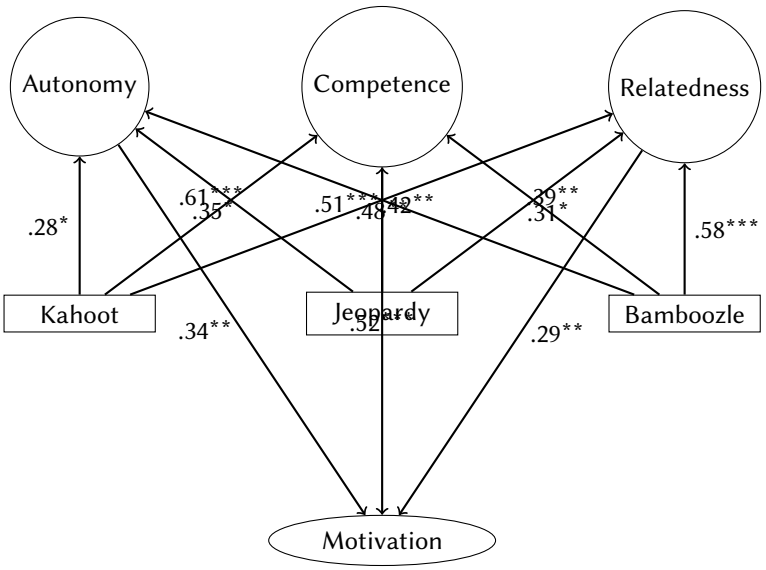

Figure 1: Structural model of platform effects on SDT components and motivation.

Note: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

5.3. RQ3: Moderating effects of individual differences

Mann-Whitney U tests revealed no significant gender differences in overall platform preferences (table 3). However, qualitative analysis suggested subtle variations in engagement patterns.

Table 3
Gender differences in platform preferences.

Platform	Gender	Mean rank	*U*	*Z*	*p*
Kahoot	Male Female	24.32 22.06	238.5	-0.62	.536
Jeopardy	Male Female	21.84 23.85	230.0	-0.74	.459
Bamboozle	Male Female	22.71 23.21	240.5	-0.53	.596

Kruskal-Wallis tests indicated no significant proficiency-based differences ($H(2) = 2.59, p = .274$). However, thematic analysis revealed proficiency-specific preferences.

5.4. RQ4: Critical features for psychological need satisfaction

Thematic analysis identified platform-specific features crucial for SDT components:

- Features supporting autonomy
  - Bamboozle: Question type selection, self-pacing, team role choice.
  - Jeopardy: Category selection, strategic wagering, difficulty choice.
  - Kahoot: Limited to nickname selection and occasional team formation.
- Features supporting competence
  - Kahoot: Immediate feedback, progress visualization, achievement streaks.
  - Jeopardy: Progressive difficulty, strategic success, knowledge demonstration.
  - Bamboozle: Collaborative problem-solving, peer learning, mistake tolerance.
- Features supporting relatedness
  - Bamboozle: Team collaboration, shared success, peer support.
  - Kahoot: Shared excitement, class-wide participation, social recognition.
  - Jeopardy: Team consultation, collective strategy, knowledge sharing.

6. Discussion

6.1. Theoretical implications

Our findings extend Self-Determination Theory by demonstrating how specific gamification mechanics differentially support psychological needs. The structural equation model reveals that competence support most strongly predicts motivation ($\beta = 0.52$), aligning with Maimaiti and Hew [12]'s assertion that mastery experiences drive sustained engagement in digital learning environments. However, our results suggest a more nuanced relationship: competence without autonomy produces fragile motivation vulnerable to performance pressure.

The paradox of Kahoot's popularity despite limited autonomy support challenges simplistic SDT applications. Following Rojabi et al. [14], we propose that intense, short-duration engagement can temporarily override autonomy needs through what might be termed "flow-induced motivation" – a state where immediate absorption supersedes reflective autonomy concerns. This phenomenon warrants theoretical elaboration, potentially expanding SDT to accommodate temporal dynamics in digital environments.

Bamboozle's superior emotional support despite modest learning effectiveness scores suggests that affective dimensions may mediate cognitive outcomes more substantially than current models acknowledge. This finding resonates with Wang and Liu [10]'s work on buoyancy as a mediator between motivation and engagement, implying that emotional scaffolding creates conditions for subsequent learning even when immediate knowledge gains appear limited.

6.2. Practical implications for ESL pedagogy

Our results offer evidence-based guidance for strategic platform selection aligned with pedagogical objectives (table 4).

Table 4
Platform selection guide based on pedagogical objectives.

Primary objective	Recommended platform	Key features	Considerations
Energy and engagement	Kahoot	Competition, music, time pressure	Monitor anxiety levels; provide alternatives for sensitive learners
Deep review	Jeopardy	Strategic thinking, category mastery	Better for intermediate+ levels; requires content familiarity
Anxiety reduction	Bamboozle	Collaboration, self-pacing, team support	May require explicit instruction on collaborative skills
Formative assessment	Kahoot or Bamboozle	Immediate feedback vs. peer discussion	Balance efficiency with depth

Based on our findings and recent literature [34, 35], we propose a cyclical implementation model:

1. Introduction phase: Use Bamboozle to reduce anxiety and build collaborative norms.
2. Practice phase: Employ Kahoot for energized practice and immediate feedback.
3. Consolidation phase: Apply Jeopardy for strategic review and self-assessment.
4. Integration phase: Combine platforms based on daily objectives and learner states.

This progression respects the developmental nature of language learning while maintaining engagement through variety.

6.3. Addressing the challenges

Our study identified several implementation challenges requiring systematic attention:

1. *Technical infrastructure*: Consistent internet connectivity and device access remain prerequisites. Institutions should conduct technical audits before implementation and maintain offline alternatives [36].
2. *Teacher professional development*: Effective gamification requires more than technical competence. Teachers need training in:
   - Recognizing signs of competitive stress.
   - Balancing game elements with learning objectives.
   - Adapting platforms to diverse learner needs.
   - Integrating games within broader pedagogical frameworks.
3. *Assessment validity*: While platforms offer engagement benefits, their assessment validity requires scrutiny. Joyce [37] demonstrated that online formative assessments can predict summative performance, but careful item construction and alignment remain essential.

6.4. Cultural and contextual considerations

The Turkish educational context influenced our findings in ways that merit explicit discussion. The collectivist cultural orientation may explain Bamboozle's strong emotional support ratings, as collaborative success aligns with cultural values. Similarly, the competitive element in Kahoot might produce different effects in more individualistic cultures [27].

The preparatory program context, with its high-stakes implications for university admission, creates unique motivational dynamics. Students' receptiveness to gamification might partially reflect desires for stress relief from traditional assessment pressures. Replication in diverse cultural and institutional contexts would strengthen generalizability claims.

7. Limitations and future directions

Several limitations constrain our findings' interpretability:

1. **Sample size and duration**: While adequate for detecting medium effects, our sample size limited sophisticated moderator analyses. The eight-week duration captured immediate responses but not long-term sustainability. Future research should employ larger samples over extended periods to examine novelty effects and sustained engagement patterns.
2. **Platform implementation variability**: Despite standardization efforts, platforms' inherent differences prevented complete equivalence. Kahoot's distinctive audiovisual elements, Jeopardy's familiar format, and Bamboozle's flexibility introduce confounds beyond controlled variables.
3. **Self-report limitations**: Reliance on self-reported attitudes and motivation may not fully capture actual learning behaviors. Future studies should incorporate objective measures such as eye-tracking, engagement analytics, and longitudinal achievement data [38].
4. **Limited scope of individual differences**: While we examined gender and proficiency, other potentially relevant variables (e.g., technology self-efficacy, gaming experience, learning styles) were not assessed. Kawaguchi and Watkins [39] demonstrated that prior gaming experience significantly influences educational game reception, suggesting important unmeasured variance.

Future research directions emerging from our findings include:

1. Comparative neurophysiological studies examining platforms' differential effects on attention, arousal, and cognitive load using EEG or fNIRS methodologies.
2. Longitudinal investigations tracking motivation trajectories across extended platform exposure, identifying critical periods for novelty decay and intervention.
3. Cross-cultural replications examining how cultural values moderate platform preferences and effectiveness.
4. Adaptive gamification research exploring AI-driven platform selection based on real-time learner states and objectives.
5. Mixed-reality extensions investigating how AR/VR integration might enhance platforms' affordances for language learning [40].

8. Conclusion

This comparative analysis illuminates the complex landscape of game-based learning in ESL education, revealing that platform effectiveness cannot be reduced to simple superiority claims. Instead, our findings support a contingency perspective: optimal platform selection depends on specific pedagogical objectives, learner characteristics, and contextual factors.

Through the lens of Self-Determination Theory, we demonstrated that Kahoot, Jeopardy, and Bamboozle differentially support autonomy, competence, and relatedness, creating distinct motivational profiles. Kahoot's strength in generating immediate engagement and competence feedback makes it ideal for energizing practice sessions, though educators must monitor potential anxiety effects. Jeopardy's strategic elements serve advanced learners seeking cognitive challenge but may overwhelm beginners. Bamboozle's collaborative flexibility and emotional support address affective barriers to learning, though potentially at the cost of immediate achievement gains.

The absence of significant gender and proficiency effects suggests these platforms' broad applicability, though qualitative insights reveal subtle preferences warranting pedagogical attention. The finding that

competence support most strongly predicts motivation underscores the importance of careful difficulty calibration and feedback design in gamified learning.

Our study contributes to the growing CALL literature by providing empirical evidence for strategic gamification grounded in motivational theory. As educational technology continues evolving, our framework offers a foundation for evaluating emerging platforms through the lens of psychological need satisfaction rather than surface features alone.

The implications extend beyond immediate platform selection to broader questions about technology's role in language education. As Henry [8] argues, motivation in digital environments emerges through complex interactions between learner agency, technological affordances, and pedagogical mediation. Our findings support this interactionist perspective while highlighting the need for adaptive, learner-centered approaches to educational gamification.

Moving forward, the field requires more sophisticated theoretical models that account for the temporal, cultural, and individual dynamics of gamified learning. The integration of learning analytics, artificial intelligence, and adaptive systems promises personalized gamification experiences that dynamically respond to learner states. However, as our study demonstrates, technological sophistication must be balanced with attention to fundamental psychological needs and pedagogical principles.

In conclusion, effective game-based language learning emerges not from platform features alone but from thoughtful integration that aligns technological affordances with learner needs and educational objectives. As educators navigate an expanding array of digital tools, our findings offer empirically grounded guidance for creating engaging, supportive, and effective language learning environments that honor both the playful potential and serious purpose of educational gamification.

Declaration on Generative AI

During the preparation of this work, the author used ChatGPT to sentence polishing. After using this tool, the author reviewed and edited the content as needed and took full responsibility for the publication's content.

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