International Journal of Computer Information Systems and Industrial Management Applications
ISSN 2150-7988 Volume 18 (2026) pp. 1-13

https://doi.org/10.70917/ijcisim-2026-3601
Article

Enhanced Gamified AI-Enhanced Dubbing Applications and Speaking Engagement in Business English: Evidence from Guangdong Universities

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Abstract: Background: Business English programmes in China face a persistent gap between students' formal language knowledge and their ability to participate actively in spoken business communication. This challenge is especially salient in Guangdong, where universities are expected to prepare graduates for the multilingual, internationally oriented labour market of the Greater Bay Area. Purpose: This study examined whether a gamified AI-enhanced dubbing application could strengthen speaking engagement among Business English students and identified which gamification elements and AI features were most closely associated with behavioral, emotional, and cognitive engagement. Methods: A quasi-experimental pretest-posttest design was implemented over eight weeks with 120 Business English majors from three Guangdong universities. Students were assigned to treatment (n = 60) and control (n = 60) conditions within intact class arrangements. Quantitative data came from engagement scales and platform analytics, while a small supplementary qualitative component of interviews and focus-group responses from treatment-group students was used to contextualize the statistical results. Results: Post-intervention overall engagement was significantly higher in the treatment group ($M = 4.28$, $SD = 0.54$) than in the control group ($M = 3.19$, $SD = 0.61$), with a large effect size ($d = 1.89$, $p < 0.001$). Behavioral engagement showed the largest gain, followed by emotional and cognitive engagement. Hierarchical regression indicated that gamification elements, AI features, and their interaction terms explained 68.2% of the variance in overall engagement, and qualitative responses suggested that visible progress indicators and AI feedback promoted repeated practice and reduced speaking anxiety. Conclusions: Gamified AI-enhanced dubbing can meaningfully increase speaking engagement in Business English classrooms when game mechanics are paired with adaptive feedback and difficulty adjustment. The findings support the pedagogical value of integrating gamification and AI rather than treating them as separate design layers.

Keywords: AI-enhanced dubbing applications, Business English, Chinese Higher education, Gamification, speaking engagement

1. Introduction

English-mediated communication now constitutes a core competence in international trade, finance, logistics, and cross-border collaboration, making spoken Business English an employability issue rather than a purely linguistic one [1]. In China, the rapid expansion of Business English programmes reflects this shift, as universities are increasingly expected to prepare graduates who can participate in negotiations, client communication, and workplace problem-solving in English [2]. Yet the growth of Business English provision has not automatically resolved the problem of oral performance in professionally oriented settings.

In Chinese higher education, Business English instruction has often been stronger in reading, translation, and examination-oriented writing than in sustained oral participation. Recent work on

Chinese tertiary and vocational contexts suggests that students may possess adequate declarative knowledge while still struggling with fluency, pragmatic appropriateness, and confidence in real-time business communication [3]. This mismatch is especially consequential in speaking tasks that require spontaneous response, negotiation, or persuasion, where anxiety, limited practice time, and weak self-efficacy can suppress active engagement.

These pressures are particularly visible in Guangdong Province. As a key node in the Guangdong-Hong Kong-Macao Greater Bay Area, Guangdong's universities serve a labour market shaped by international trade, finance, manufacturing, and technology industries, all of which place a premium on confident oral communication in English [4]. Conventional speaking instruction, however, often provides limited opportunities for repeated, feedback-rich practice. This makes technology-enhanced intervention pedagogically attractive. AI-supported language tools can supply immediate pronunciation feedback, adaptive difficulty, and data-driven personalization, while gamification can sustain participation through visible progress, recognition, and goal-oriented practice [5-6].

Although these two strands of work are both expanding, they have more often been investigated separately than as an integrated instructional design. Research on gamification shows consistent benefits for engagement, and research on AI in language education highlights personalization and feedback, but far less is known about their combined effect on speaking engagement in Business English classrooms, especially in Mainland Chinese university settings. This study therefore examined a gamified AI-enhanced dubbing application in three Guangdong universities. It addressed three research questions: RQ1: To what extent does a gamified AI-enhanced dubbing application improve overall speaking engagement and its behavioral, emotional, and cognitive dimensions among Business English students? RQ2: Which gamification elements are most strongly associated with these dimensions of speaking engagement? RQ3: How do AI-based features moderate the relationship between gamification elements and speaking engagement?

This study is significant in three respects. Theoretically, it brings Self-Determination Theory, Flow Theory, the Technology Acceptance Model, and Engagement Theory into a single explanatory frame for understanding speaking engagement in AI-mediated language learning. Pedagogically, it offers evidence relevant to Business English instructors who need scalable ways to increase repeated oral practice without sacrificing task relevance. Technologically and from a design perspective, it identifies which combinations of game mechanics and AI functions appear most supportive of sustained participation in a Guangdong university context.

2. Literature Review

2.1. Theoretical Foundations

The present study is grounded in four complementary perspectives. Self-Determination Theory [7] explains why game mechanics may strengthen engagement when they support autonomy, competence, and relatedness; learner choice, progressive challenge, and socially visible achievement are particularly relevant here. Flow Theory highlights the importance of a balance between task challenge and perceived skill, suggesting that speaking practice becomes more absorbing when feedback is immediate and difficulty is adjustable [8]. The Technology Acceptance Model adds that even motivationally rich tools will be used only if learners perceive them as useful and easy to operate [9]. Engagement Theory, finally, locates participation in purposeful, interactive activity and therefore helps explain why business-oriented dubbing tasks may attract sustained involvement when they simulate authentic communicative demands [10]. Taken together, these frameworks suggest that gamification and AI are not separate motivational add-ons; they can work conjointly by aligning challenge, usability, feedback, and task meaning.

2.2. Gamification in Language Learning

Gamification in language learning is most effective when game elements are aligned with pedagogical goals rather than added as superficial rewards. Reviews in educational technology and second-language learning consistently report positive effects on participation, persistence, and enjoyment, but also caution that outcomes depend on design quality, learner characteristics, and the balance between intrinsic and extrinsic motivation [11-13]. In language classrooms, points, badges, leaderboards, and progress indicators can turn abstract learning trajectories into visible short-term goals, yet their effects are uneven: competitive features may stimulate activity, whereas self-monitoring tools are more consistently linked to sustained engagement and self-regulation. What remains underdeveloped in this literature is evidence from professionally oriented speaking contexts, where motivation must support repeated oral rehearsal rather than short bursts of quiz-like participation.

2.3. AI in Oral English and Business English Learning

AI-based language learning has shifted attention from static digital resources to adaptive systems able to respond to learner performance in real time. Reviews show that speech recognition, automated pronunciation analysis, and intelligent feedback can improve oral accuracy and fluency by increasing opportunities for low-stakes practice and individualized correction [5] [14-15]. For Business English, the potential is especially strong because AI tools can present scenario-specific prompts, simulate workplace interaction, and tailor feedback to recurring learner difficulties. At the same time, the literature warns against treating AI as inherently transformative: its educational value depends on how well feedback is interpreted, whether task content matches curricular goals, and whether students see the system as both usable and instructionally worthwhile. These conditions make AI a plausible amplifier of pedagogically meaningful gamification rather than a substitute for it.

2.4. Speaking Engagement as a Multidimensional Construct

Speaking engagement is best understood as a multidimensional construct encompassing behavioral participation, emotional investment, and cognitive involvement [16-17]. In oral language learning, behavioral engagement is visible in frequency of practice, persistence, and willingness to repeat tasks; emotional engagement includes enjoyment, anxiety reduction, and confidence; cognitive engagement concerns strategic attention, reflection, and the effort devoted to improving performance. Technology-mediated studies in adjacent ESL contexts suggest that digital tools can strengthen all three dimensions, but not to the same degree [18-19]. This distinction matters because an intervention may increase participation and enjoyment more quickly than it deepens metacognitive processing, especially in short-term speaking programmes.

2.5. Review Gap and Conceptual Positioning of the Present Study

Despite rapid growth in both gamification and AI research, relatively few studies have examined their integrated role in speaking engagement, and fewer still have done so in Business English programmes within Mainland China. Existing work often addresses general language learning, isolated digital tools, or non-Chinese contexts, leaving unanswered questions about how specific game mechanics and AI functions interact in professionally oriented speaking instruction. The present study addresses this gap by testing a gamified AI-enhanced dubbing application with Business English students in Guangdong universities and by combining quasi-experimental evidence with a small qualitative layer to explain why particular engagement patterns emerged. The methodology that follows was designed to capture both the magnitude of the intervention effect and the mechanisms implied by the three research questions.

3. Methodology

3.1. Research Design

This study adopted a quasi-experimental pretest-posttest control-group design with a supplementary qualitative component. A fully randomized experiment was not feasible because teaching was organized through existing class arrangements across the three participating universities; accordingly, intact classes were assigned to treatment and control conditions while equivalence was checked statistically at baseline. The quantitative strand examined changes in overall, behavioral, emotional, and cognitive speaking engagement over an eight-week intervention. The qualitative strand was used more modestly, as an explanatory supplement to clarify how students experienced the gamification elements and AI feedback features embedded in the dubbing application.

3.2. Participants

Participants were 120 Business English majors from three universities in Guangdong Province. Stratified sampling at the institutional level was used to ensure representation across the participating programmes, after which comparable intact classes were allocated to the treatment ($n = 60$) and control ($n = 60$) conditions. Eligibility criteria included enrolment in the second or third year of a Business English programme, an intermediate English proficiency level broadly corresponding to CEFR B1-B2, and no prior systematic use of AI-enhanced dubbing applications. The sample was balanced by gender (52% female, 48% male) and relatively homogeneous in age ($M = 20.3$, $SD = 1.2$). Because allocation operated within existing classroom structures rather than through full individual randomization, the study is reported as quasi-experimental; baseline tests nevertheless indicated that the two groups were comparable on proficiency, technology self-efficacy, and engagement measures.

3.3. Intervention

Over eight weeks, the treatment group used an AI-enhanced dubbing application during weekly 90-minute Business English speaking sessions. The platform combined four focal gamification elements, namely points, achievement badges, progress tracking, and leaderboards, with three AI functions: real-time pronunciation feedback, adaptive difficulty adjustment, and intelligent recommendation of follow-up practice. Tasks were embedded in business-relevant scenarios such as client meetings, negotiations, and presentations so that repetition occurred within disciplinary content rather than decontextualized drills. Implementation followed a common protocol across sites: instructors introduced the platform, demonstrated key functions, and then supervised guided practice before students moved into more independent use. The control group completed parallel Business English speaking activities, including pronunciation drills, paired role-play, and group discussion, for the same amount of instructional time but without AI support or gamified features.

3.4. Research Instruments

Three instruments were used to capture intervention effects. First, a multidimensional speaking engagement scale adapted from Fredricks et al. (2004) measured behavioral engagement (e.g., practice frequency and task persistence), emotional engagement (e.g., enjoyment and anxiety reduction), and cognitive engagement (e.g., strategy use and metacognitive monitoring) [16]. Second, a Gamification Elements Assessment questionnaire used five-point Likert items to gauge students' perceptions of the motivational value of individual game mechanics. Third, platform analytics recorded session duration, practice frequency, feature use, feedback uptake, and movement across difficulty levels. Together, these sources enabled triangulation between self-reported engagement and observable patterns of application use.

3.5. Data Collection Procedures

Data were collected at three points across the eight-week intervention: pretest in Week 1, progress monitoring in Week 4, and post-test in Week 8. Standardized administration procedures were used across sites, and the research team conducted regular checks on data completeness, scoring consistency, and analytic logs. In addition, a small supplementary qualitative dataset was gathered after the intervention from volunteer students in the treatment condition because only these participants had direct experience of the AI-enhanced dubbing application. Semi-structured interview prompts and a follow-up focus-group discussion centred on perceptions of badges, points, progress tracking, AI feedback, repeated oral practice, and speaking anxiety. This qualitative component was intended to contextualize the quantitative results rather than to function as an independent parallel dataset.

3.6. Data Analysis

Quantitative analyses were conducted in SPSS 28.0. Descriptive statistics were used to summarize sample characteristics and baseline profiles. ANCOVA and group-by-time comparisons were used to examine intervention effects on post-test engagement while accounting for pre-intervention differences, and hierarchical multiple regression was used to estimate the contributions of gamification elements, AI features, and their interaction terms to overall engagement. Cohen's d and partial eta squared were reported to indicate practical significance. Assumptions of normality, homogeneity of variance, and linearity were checked before model estimation. The qualitative material was analysed through a concise thematic coding process focused on explanatory patterns that could illuminate the quantitative results, especially differences across behavioral, emotional, and cognitive engagement.

3.7. Validity and Reliability

Several steps were taken to strengthen validity. Internal validity was supported through the use of comparable intact classes, standardized intervention procedures, equivalent contact time across conditions, and baseline controls for proficiency, technology self-efficacy, and prior engagement. Because the study was quasi-experimental rather than fully randomized, baseline equivalence testing was especially important in establishing defensible comparison between groups. External validity was enhanced by involving three universities with similar Business English curricula in Guangdong, although the findings should still be generalized cautiously to other institutional, linguistic, or regional contexts.

Credibility of the supplementary qualitative strand was addressed through purposeful explanatory sampling from the treatment group, the use of a common interview guide, and analytic comparison of recurring response patterns with the quantitative trends. Instructor orientation sessions and shared implementation guides were also used to reduce site-level variation in how the application was introduced

and monitored. These procedures do not remove all contextual variation, but they increase confidence that the observed differences were associated primarily with the intervention rather than uneven delivery.

Reliability testing of the research instruments yielded satisfactory psychometric properties. Internal consistency was estimated using Cronbach's alpha:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_{Y_i}^2}{\sigma_X^2}\right) \tag{1}$$

where k is the number of items, σ_i^2 is the variance of each item, and σ_t^2 is the total-score variance. The overall Speaking Engagement Scale showed excellent reliability (α = 0.92), and the subscales also demonstrated acceptable to strong consistency: behavioral engagement (α = 0.87), emotional engagement (α = 0.89), and cognitive engagement (α = 0.85).

Inter-rater reliability for the speaking-related ratings was estimated using Cohen's kappa:

$$\kappa = \frac{P_o - P_e}{1 - P_e} \tag{2}$$

where P_o represents observed agreement and P_e represents agreement expected by chance. The resulting κ = 0.88 indicated substantial agreement between raters. Test-retest reliability, estimated through the intraclass correlation coefficient for a subset of participants (n = 30), yielded ICC = 0.91, suggesting stable engagement measurement across the intervention period.

3.8. Ethical Considerations

The study received ethics approval from the relevant institutional review processes of the participating universities. All participants provided informed consent after being informed of the study purpose, procedures, potential risks, and their right to withdraw at any time without penalty. Voice recordings, questionnaire data, and platform analytics were anonymized before analysis and stored through password-protected procedures accessible only to authorized members of the research team. Participants were also informed of their right to review summary findings and to request correction or removal of identifiable data before dataset closure.

4. Results

4.1. Descriptive Results

Table 1 shows that the final sample of 120 Business English majors was well balanced across the two conditions. The treatment and control groups were similar in age, gender composition, year of study, English proficiency, technology self-efficacy, and prior experience with language-learning applications; none of the baseline comparisons reached significance. Figure 1 visually confirms the same pattern across the three engagement dimensions, with near-overlapping error bars and scores clustered around the middle of the scale. This baseline comparability supports the use of the two groups as defensible counterparts in the subsequent intervention analyses.

At pretest, overall engagement was moderate (M = 3.12, SD = 0.60). Among the three dimensions, behavioral engagement was lowest (M = 2.89, SD = 0.72), emotional engagement was highest (M = 3.34, SD = 0.81), and cognitive engagement occupied an intermediate position (M = 3.12, SD = 0.68). Multivariate equivalence testing showed no significant pre-intervention differences between groups, Wilks' λ = 0.98, F (3, 116) = 0.82, p = 0.49. These results indicate that any post-intervention divergence is unlikely to reflect pre-existing group imbalance.

Table 1. Baseline Characteristics and Speaking Engagement Scores by Group

Variable	Treatment Group (n=60)	Control Group (n=60)	Total Sample (n=120)	t-value	p-value
Demographics					
Age (years)	20.2 ± 1.1	20.4 ± 1.3	20.3 ± 1.2	-0.91	0.365
Gender (% Female)	51.7%	53.3%	52.5%	χ^2=0.03	0.857
Year of Study					
- Second Year	60.0%	56.7%	58.3%	χ^2=0.14	0.712
- Third Year	40.0%	43.3%	41.7%		
English Proficiency					
TOEFL Score Equivalent	78.4 ± 8.2	77.6 ± 7.9	78.0 ± 8.0	0.54	0.588
Self-rated Proficiency	3.2 ± 0.7	3.1 ± 0.8	3.2 ± 0.7	0.71	0.479
Speaking Engagement (1-5 scale)					
Behavioral Engagement	2.91 ± 0.71	2.87 ± 0.74	2.89 ± 0.72	0.30	0.765
Emotional Engagement	3.36 ± 0.79	3.32 ± 0.84	3.34 ± 0.81	0.27	0.789
Cognitive Engagement	3.14 ± 0.66	3.10 ± 0.71	3.12 ± 0.68	0.32	0.752
Overall Engagement	3.14 ± 0.58	3.10 ± 0.62	3.12 ± 0.60	0.37	0.715
Technology Variables					
Technology Self-efficacy	3.47 ± 0.61	3.43 ± 0.66	3.45 ± 0.63	0.34	0.732
Prior App Experience	1.8 ± 0.9	1.9 ± 0.8	1.9 ± 0.9	-0.64	0.523

Note: Values presented as Mean ± SD or percentage. All scales ranged from 1 (low) to 5 (high).

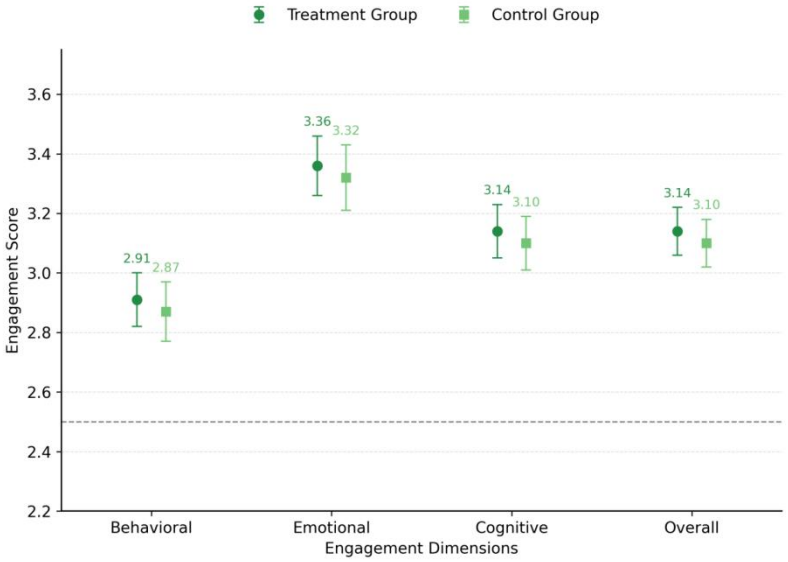

Figure 1. Baseline Speaking Engagement Dimensions by Group

Figure 1. Baseline speaking engagement scores across behavioral, emotional, and cognitive dimensions for treatment and control groups. Error bars represent standard errors. The dashed line indicates the scale midpoint (2.5).

4.2. Effects of Gamification on Engagement

As shown in Figure 2, the intervention produced a marked improvement in overall speaking engagement. After controlling for baseline variation, the treatment group recorded a significantly higher post-intervention mean (M = 4.28, SD = 0.54) than the control group (M = 3.19, SD = 0.61), F (1, 117) = 112.34, $p < .001$, partial $\eta^2 = .49$. The between-group difference was large in practical terms (Cohen's $d = 1.89$), indicating that the gamified AI-enhanced dubbing application was associated with substantially stronger engagement than conventional speaking instruction over the same period.

The dimensional pattern was not uniform. Behavioral engagement showed the strongest gain in the treatment group (2.91 to 4.42; $\Delta = 1.51$), whereas the control group changed only marginally (2.87 to 2.95; $\Delta = 0.08$), producing a significant Group × Time effect, F (1, 118) = 89.76, $p < .001$. Emotional

engagement also increased clearly in the treatment condition (Δ = 1.02) but only minimally in the control condition (Δ = 0.11). Cognitive engagement improved in the treatment group as well (Δ = 0.94), although the magnitude of change was smaller than that observed for behavioral engagement. Figure 2 therefore suggests a graded intervention effect: the application first strengthened visible participation and persistence, then positive affect and anxiety reduction, and only somewhat less strongly deeper strategic involvement.

Post-test comparisons confirmed that the treatment group outperformed the control group across all dimensions: behavioral engagement, $t(118) = 11.24$, $p < .001$; emotional engagement, $t(118) = 8.67$, $p < .001$; and cognitive engagement, $t(118) = 7.43$, $p < .001$. The contrast is important because it shows that the intervention did not merely raise one narrow aspect of participation. Rather, it enhanced the frequency of practice, the affective willingness to speak, and the cognitive investment brought to speaking tasks, with the strongest effect concentrated in the behavioral domain.

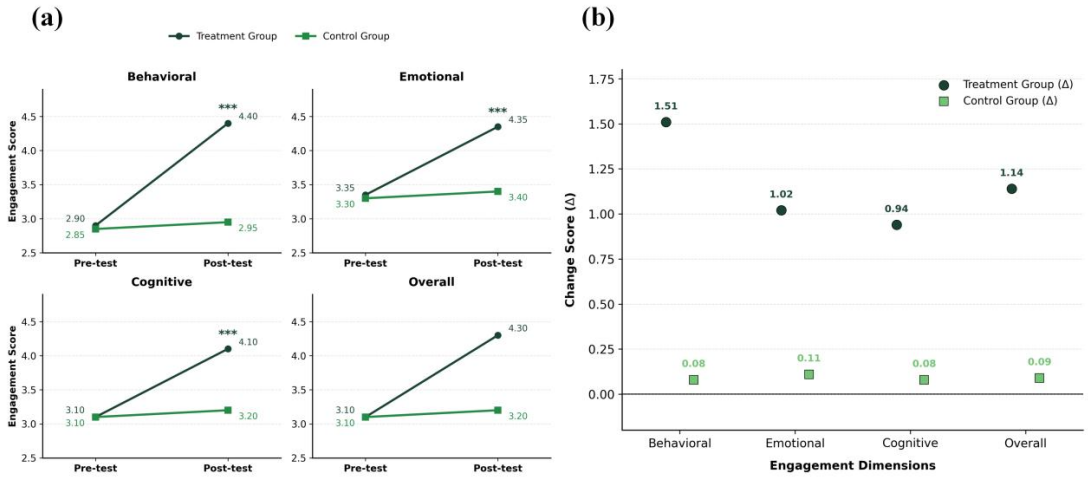

Figure 2. Pre-Post Engagement Scores by Group and Dimension

Figure 2. Effects of gamification on speaking engagement across dimensions. Panel (a) displays pre-intervention and post-intervention scores for treatment and control groups across behavioral, emotional, cognitive, and overall engagement dimensions, with lighter shades representing pre-test scores and darker shades representing post-test scores. Panel (b) illustrates change scores (post minus pre) highlighting the differential improvements between groups. Asterisks indicate significant between-group differences at post-intervention (***p < 0.001).

4.3. Effects of Specific Gamification Elements

Figure 3 and the accompanying regression coefficients indicate that the four gamification elements contributed differently to engagement. The points system was the strongest predictor of behavioral engagement (β = 0.42, p < .001), suggesting that immediate quantitative feedback encouraged frequent practice and task completion. Achievement badges were most strongly associated with emotional engagement (β = 0.38, p < .001), which implies that visible recognition of progress may have supported confidence and satisfaction during speaking practice.

The effects of the other elements were more differentiated. Leaderboards were positively related to behavioral engagement (β = 0.28, p < .01) but only weakly to cognitive engagement (β = 0.15, p < .05), indicating that competition was better at stimulating participation than at deepening strategy use. By contrast, progress tracking showed moderate and relatively balanced associations with behavioral (β = 0.31), emotional (β = 0.29), and cognitive engagement (β = 0.33), all p < .001. This pattern helps explain the heat-map distribution in Figure 3: some mechanics acted as short-term activators, whereas progress visualization functioned as a more stable self-regulatory support across engagement dimensions.

The interaction analysis further suggests that these elements worked best in combination rather than in isolation, $F(6, 112) = 4.23$, $p < .001$. In particular, the points-badges combination yielded the strongest synergy (interaction β = 0.18, p < .01), indicating that immediate reward and milestone recognition reinforced one another. The figure therefore supports a design interpretation as much as a statistical one: an effective gamified speaking environment appears to depend on complementary mechanics that reward action, signal improvement, and make progress visible over time.

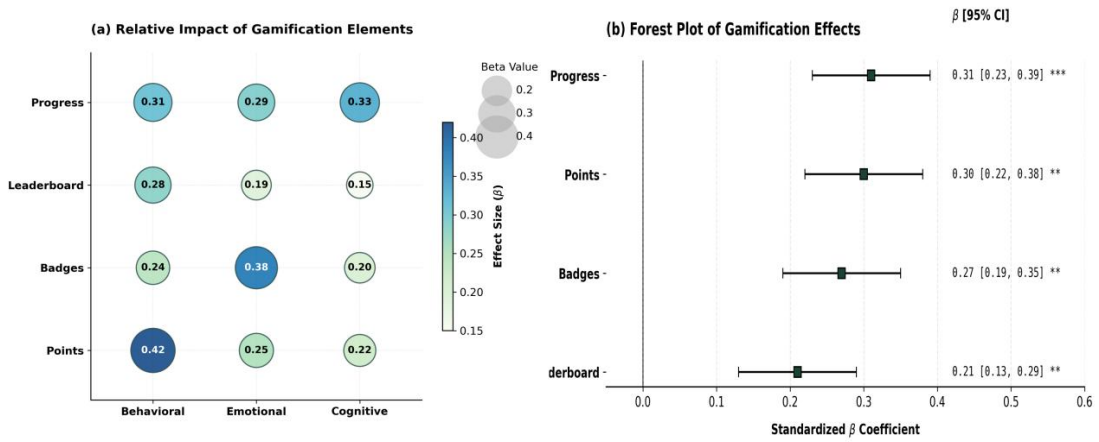

Figure 3. Effects of Gamification Elements on Engagement Dimensions

Figure 3. Differential effects of gamification elements on engagement dimensions. Panel (a) presents a heat map of standardized regression coefficients (β) showing the strength of association between each gamification element and specific engagement dimensions, with darker colors indicating stronger effects. Panel (b) displays overall standardized coefficients with 95% confidence intervals, aggregated across all engagement dimensions. Asterisks denote significance levels (*p < 0.05, **p < 0.01, ***p < 0.001).

4.4. Moderating Role of AI Features

Figure 4 shows that AI features functioned as moderators of the relationship between gamification and speaking engagement rather than as separate or mediating outcomes. Higher levels of AI support strengthened the positive association between gamification intensity and engagement, indicating that the same game mechanics became more effective when paired with responsive feedback and adaptive personalization.

Among the three AI functions, personalized feedback appears especially important because it connects performance information to specific opportunities for improvement. In the present intervention, feedback on pronunciation, fluency, and delivery allowed students to repeat tasks with a clearer sense of what to adjust, while adaptive difficulty helped maintain an achievable but challenging level of task demand. Interpreted through Figure 4, these mechanisms likely reduced the risk that game mechanics would become either empty rewards or sources of frustration.

Intelligent recommendations added a further layer of support by directing students toward subsequent practice activities on the basis of prior performance and engagement history. This feature is analytically important because it made the system more than a repository of speaking tasks: it became an adaptive sequence that linked reward, feedback, and next-step guidance. The moderating pattern in Figure 4 is therefore consistent with a synergistic interpretation in which AI features amplified the motivational value of gamification by making practice more personalized, timely, and instructionally relevant.

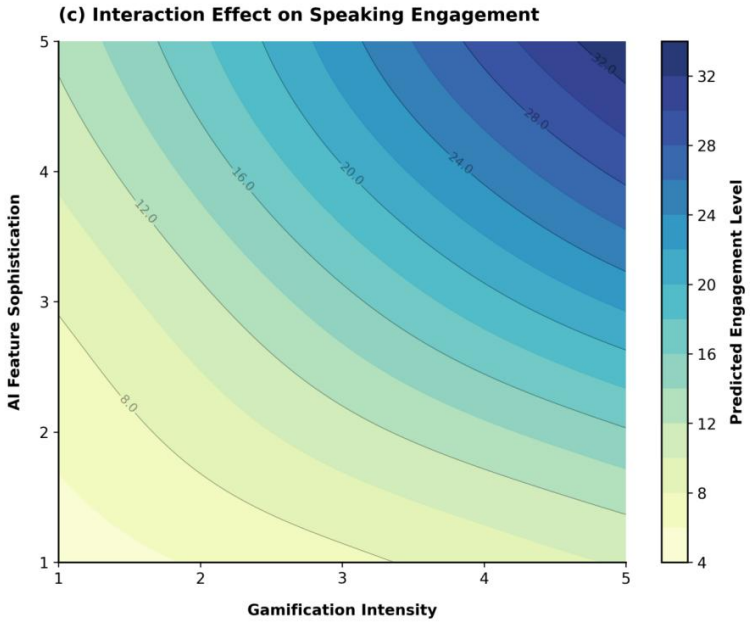

Figure 4. Moderating Effects of AI Features on Gamification-Engagement Relationship

The three-dimensional surface in Figure 4 makes this moderation effect visually explicit. When both gamification intensity and AI feature sophistication were high, predicted speaking engagement reached its highest levels; when either dimension was weak, the slope flattened noticeably. The figure therefore supports the claim that the strongest engagement gains emerged from integration, not from gamification or AI in isolation.

4.5. Regression Analysis Results

Table 2 presents the hierarchical regression models for overall speaking engagement. The full model, which included control variables, gamification elements, AI features, and interaction terms, explained 68.2% of the variance in overall engagement (R^2 = 0.682, adjusted R^2 = 0.671, F(13, 106) = 21.03, p < .001). This is a substantial level of explained variance and indicates that the combined design variables captured a large share of the engagement differences observed after the intervention.

The stepwise results clarify where this explanatory power came from. Control variables accounted for 11.2% of the variance in Model 1. Adding the gamification elements increased the explained variance to 45.3%, and the introduction of AI features raised it further to 59.8%. The interaction terms then contributed an additional 8.4%, bringing the final model to 68.2%. Across the dimension-specific models, behavioral engagement was the most strongly predicted outcome (R^2 = 0.724), followed by emotional engagement (R^2 = 0.659) and cognitive engagement (R^2 = 0.621), which is consistent with the descriptive pattern reported earlier.

The interaction coefficients identify the most influential combinations. Badges × adaptive difficulty was the strongest interaction term (β = 0.42, p < .001), followed by progress tracking × intelligent recommendations (β = 0.38, p < .001) and points × personalized feedback (β = 0.35, p < .001). In substantive terms, these coefficients suggest that gamification was most effective when AI features translated reward signals into tailored challenge and feedback. The regression results therefore support the same conclusion as Figures 3 and 4: AI-enhanced personalization amplified, rather than merely accompanied, the motivational effects of gamification.

Table 2. Hierarchical Multiple Regression Analysis Results for Speaking Engagement

Variable	Model 1	Model 2	Model 3	Model 4
Step 1: Control Variables				
Gender	0.08	0.06	0.05	0.04
Prior English Proficiency	0.23***	0.18**	0.15**	0.12*
Technology Self-efficacy	0.19**	0.14*	0.11*	0.09
Step 2: Gamification Elements				
Points System	-	0.28***	0.24***	0.18**
Achievement Badges	-	0.31***	0.27***	0.19**
Leaderboards	-	0.22**	0.19**	0.14*
Progress Tracking	-	0.26***	0.23***	0.17**
Step 3: AI Features				
Personalized Feedback	-	-	0.32***	0.24***
Adaptive Difficulty	-	-	0.29***	0.21***
Intelligent Recommendations	-	-	0.25***	0.18**
Step 4: Interaction Terms				
Points × Personalized Feedback	-	-	-	0.35***
Badges × Adaptive Difficulty	-	-	-	0.42***
Progress × Intelligent Recommendations	-	-	-	0.38***
Model Statistics				
R^2	0.112	0.453	0.598	0.682
ΔR^2	0.112***	0.341***	0.145***	0.084***
F	4.93**	15.67***	19.84***	21.03***
df	(3, 116)	(7, 112)	(10, 109)	(13, 106)

***Note:** N = 120. Values represent standardized beta coefficients. *p < 0.05, **p < 0.01, ***p < 0.001

As Table 2 shows, each step of the regression model added meaningful explanatory power. Gamification made the largest single contribution, but AI features and interaction terms substantially improved model fit beyond that baseline. This pattern matters because it demonstrates that engagement was shaped not only by the presence of game mechanics, but by the way those mechanics were made adaptive, interpretable, and instructionally responsive through AI.

4.6. Supplementary Qualitative Insights

Qualitative responses from the post-intervention interviews and focus-group discussion suggested that the strongest behavioral gains were driven by the application's capacity to turn speaking practice into a visible cycle of attempt, feedback, and retry. Students commonly reported that points, badges, and progress tracking gave them clear short-term targets and made repeated rehearsal feel purposeful rather than repetitive. These responses are consistent with the quantitative pattern in Figure 3, where points and progress tracking were especially salient for behavioral engagement, and they also help explain why leaderboards were experienced as secondary: comparison with peers was motivating for some learners, but self-monitoring and incremental progress appeared more central to sustained practice.

Interview evidence also indicated that AI feedback reduced the affective cost of speaking practice. Participants frequently described immediate pronunciation feedback and adaptive task adjustment as supportive because they could rehearse privately, notice specific problems, and try again before speaking in front of others. This helps interpret the strong rise in emotional engagement and the moderating pattern shown in Figure 4. At the same time, qualitative responses suggested that cognitive engagement improved less dramatically because deeper strategy use required more than repetition and reward; learners became more reflective when feedback directed attention to particular pronunciation or discourse issues, but metacognitive engagement still depended on deliberate guidance and task framing. The qualitative findings therefore reinforce rather than replace the quantitative results.

5. Discussion

The results show that a gamified AI-enhanced dubbing application can substantially strengthen speaking engagement in Business English classrooms, with the strongest gains occurring in the domains most directly tied to repeated participation. This overall pattern is compatible with the theoretical integration proposed earlier. From a Self-Determination Theory perspective, the intervention supported competence through immediate feedback, autonomy through self-paced repeated practice, and

relatedness through socially visible progress markers. From a Flow perspective, the combination of adaptive difficulty and short-cycle feedback helped keep tasks within a workable challenge range. The findings also align with the Technology Acceptance Model and Engagement Theory: the application appears to have been experienced as useful and actionable precisely because it embedded speaking practice in recognizable business scenarios rather than in decontextualized drills.

The particularly large increase in behavioral engagement deserves specific attention. Speaking practice is often constrained by embarrassment, limited classroom time, and uncertainty about progress. Points, badges, and progress tracking appear to have reduced these barriers by making speaking activity countable, repeatable, and visibly improvable. This helps explain why points were the strongest predictor of behavioral engagement and why progress tracking showed cross-dimensional value. The weaker role of leaderboards in cognitive engagement is equally instructive: competitive display can prompt participation, but deeper strategic processing seems to depend more on feedback and self-monitoring than on comparison with peers. In this respect, the study extends previous gamification research by showing that not all game elements operate through the same motivational pathway in speaking-oriented tasks.

The moderating role of AI features further suggests why the integrated design outperformed what gamification alone would be expected to achieve. Personalized feedback likely reduced speaking anxiety by converting errors into revisable performance cues, while adaptive difficulty helped sustain flow and prevented both underload and discouragement. These mechanisms are especially relevant in Guangdong's Business English context, where students must practice professionally situated oral communication but may receive limited individualized feedback in conventional classrooms. Pedagogically, the findings imply that AI-enhanced gamified dubbing is most promising when it is tied to authentic business scenarios, repeated low-stakes rehearsal, and transparent progress signals. From a design standpoint, the results argue for prioritizing feedback-rich and progress-visible features over competition alone.

Several limitations should temper the interpretation of these findings. The sample was confined to 120 students from three universities in Guangdong, so the results should not be generalized too readily to other provinces, disciplines, or proficiency levels. The intervention lasted only eight weeks, which is sufficient for detecting engagement change but not for determining long-term sustainability or transfer to broader oral proficiency outcomes. Some measures relied on self-report, and the qualitative component was intentionally supplementary rather than a full mixed-methods strand. Finally, although the quasi-experimental design and baseline checks strengthen causal interpretation, intact-class allocation means that unmeasured classroom factors cannot be ruled out completely.

6. Conclusion

This study shows that gamified AI-enhanced dubbing can significantly improve speaking engagement among Business English students in Guangdong universities. Empirically, the intervention produced large gains in overall engagement, with the strongest improvement in behavioral engagement and meaningful gains in emotional and cognitive engagement. Theoretically, the study demonstrates the value of explaining engagement through the combined lens of motivation, flow, technology acceptance, and task-based participation. Practically, it suggests that Business English instruction benefits most when game mechanics are coupled with adaptive feedback, difficulty adjustment, and business-relevant speaking scenarios. Future research should test the durability of these effects over longer interventions, examine whether engagement gains transfer to independent speaking performance, and compare similar designs across broader institutional and regional settings.

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