ISSN 2522-6398 Vol. 8, Issue 2: 41-50, DOI: 10.25236/FER.2025.080207

Level up English Learning Outcomes through Gamification: A Case Study from Western Guangdong

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Abstract: *Amid growing emphasis on technology-enhanced language learning and persistent educational challenges in resource-limited regions, this study investigates the efficacy of the Khan Academy app for English instruction in junior high schools, framed through the Technology Acceptance Model (TAM). Employing a mixed-methods quasi-experimental design, the research involved 120 students from two classes in Western Guangdong, China, over an 8-week intervention. Quantitative and qualitative data were collected and analyzed to evaluate the app's impact. Key findings include: (1) Students reported high perceived learning efficiency (M= 4.23, SD= 0.58) and interface usability (M= 4.01, SD= 0.62) via post-intervention surveys; (2) The app's gamified features significantly enhanced students' learning motivation (M=4.12, p<.01) and classroom engagement (M= 4.05, p< .01); (3) The experimental group outperformed the control group in post-test English scores (F=15.67, p<.001), controlling for baseline performance; and (4) TAM-derived measures of technology acceptance showed a strong positive correlation with learning outcomes (r=0.73, p<.01). These results underscore the potential of adaptive gamified digital tools to address resource constraints while fostering engagement and achievement. The study offers practical insights for integrating technology-driven pedagogies in underserved educational contexts, contributing empirical support to TAM's applicability in language education reform.*

Keywords: *TAM; Khan Academy Kids; Gamification; English teaching; Learning outcomes*

1. Introduction

1.1 Research Background

In an era of rapid technological advancement, education systems worldwide face pressure to adopt student-centered pedagogy that improve learning outcomes. Nowhere is this shift more critical than in western Guangdong, where junior high school English education grapples with systemic challenges: chronic disengagement, subpar exam performance, and teacher-centered instruction ill-suited to digital-native learners. Gamified teaching, an innovative teaching method that incorporates game elements such as badges, leaderboards, and reward mechanisms into the teaching process, has shown promise in revitalizing language education. However, its effectiveness remains untested in resource-constrained regions where infrastructural gaps and uneven teacher preparedness may constrain implementation. This study address this gap by examining Khan Academy's gamified English modules through the lens of Technology Acceptance Model (TAM), which evaluates how perceived usefulness and ease of use shape technology adoption. By bridging the gap between gamification research and resource-limited realities, the study aims to advance both pedagogical practice and theoretical understanding of TAM's adaptability in marginalized contexts.

1.2 Regional Context

The educational landscape in Western Guangdong reflects the complexities of rapid economic development juxtaposed with persistent inequities. The region's urban-rural divide is stark: the first one is infrastructure disparity. Urban schools in cities like Guangzhou and Shenzhen utilize smart with interactive whiteboards, while rural counterpart in Zhanjiang, Yangjiang and Maoming often lack reliable internet access, operating with a student-to-computer ratio of 5:1 (Guangdong Statistical

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Yearbook, 2023). The second divide is teacher preparedness. Only 32% of rural English teachers report confidence in using digital tools, citing limited professional development opportunities. This contrast sharply with urban educators, 68% of whom participate in annual tech-training programs. Another is socioeconomic divide. Over 40% of rural students lack home access to smartphones or computers, hindering their ability to engage with digital homework platforms. These challenges are compounded by cultural attitudes favoring exam-centric instruction, which often marginalizes technology-driven pedagogy. Yet, the region's constraints also present opportunities: Khan Academy's offline functionality and scaffolding, gamified design align with low-resource needs, offering a viable pathway to mitigate engagement gaps.

1.3 Research Objectives

In view of this, the current study aims to address these regional challenges through a comprehensive investigation of Khan Academy's implementation in English language education. The objective is to evaluate the effectiveness of Khan Academy as a digital learning platform within specific educational context. This evaluation encompasses not only traditional measures of academic achievement but also considers the platform's adaptability to local conditions and its ability to bridge existing educational gaps.

2. Theoretical Framework

This study integrates three complementary theoretical perspectives to provide a comprehensive framework for understanding technology-enhanced language learning in western Guangdong's educational context. The integration of these theories offers a multifaceted lens through which to examine the complex interactions between technology, pedagogy, and learning outcomes.

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model serves as the theoretical foundation for understanding how teachers and students in Western Guangdong approach and adopt educational technology. Davis's (1989) TAM framework has been adapted to consider the unique characteristics of the regional educational context, particularly focusing on how perceived usefulness and ease of use are influenced by local infrastructure and resource constraints. The model's application in this study extends beyond traditional technology acceptance parameters to incorporate regional-specific factors that may influence users' behavioral intentions and actual system use. Within this adapted framework, perceived usefulness is examined through the lens of local educational needs and challenges, considering how technology solutions can address specific regional learning objectives. The ease of use construct is analyzed within the context of local infrastructure limitations and varying levels of technical proficiency among users. This regional adaptation of TAM provides valuable insights into how behavioral intentions toward technology use are shaped by local contextual factors and how these intentions translate into actual system use patterns in resource-limited settings.

2.2 Self-Determination Theory (SDT)

Self-Determination Theory (Deci & Ryan, 2000) provides a crucial framework for understanding student motivation and engagement in technology-enhanced learning environments. In the context of this study, SDT's three fundamental psychological needs – autonomy, competence, and relatedness – are examined within the specific cultural and educational context of Western Guangdong. The theory helps explain how digital learning platforms can support or hinder students' intrinsic motivation and psychological well-being. The application of SDT in this research focuses particularly on how technology-enhanced learning environments can support student autonomy through self-paced learning opportunities, foster competence through appropriate feedback mechanisms, and facilitate relatedness through peer interaction and community building.

2.3 Flow Theory

Csikszentmihalyi's Flow Theory (1990) provides the third theoretical pillar, offering insights into student engagement and optimal learning experiences in digital environments. The theory's application in this study focuses on understanding how flow states can be achieved within the constraints of local

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educational settings while considering cultural and technological factors that may influence students' engagement patterns. The research examines how optimal challenge levels can be maintained in digital learning environments, particularly considering the varying skill levels and learning backgrounds of students in Western Guangdong. Flow Theory's application extends to analyzing how digital platforms can create balanced learning experiences that maintain student engagement while accounting for local cultural preferences and learning styles.

3. Literature Review

3.1 Empirical Studies on Gamified Teaching

The application of gamified teaching in education has received widespread scholarly attention, and empirical studies have validated its positive impact on learning motivation, engagement, and academic performance across various educational levels. In higher education, numerous studies have highlighted the effectiveness of gamified learning environments. For example, Dicheva et al. (2015) investigated the integration of gamified elements such as points, badges, and leaderboards in university courses. Their findings underscored that these elements significantly enhance college students' learning motivation, driving their pursuit of higher academic achievements. Similarly, Buckley and Doyle (2016) demonstrated that gamified activities can simultaneously boost extrinsic motivation (through tangible rewards like grades or points) and intrinsic motivation (through enjoyment and personal satisfaction). These findings indicate that gamification generates diverse motivational benefits, making it a promising instructional tool in higher education. In China, gamified teaching has also demonstrated substantial benefits. Liu Jianda et al. (2024) explored the use of electronic portfolios in formative assessments, where students received gamified rewards for task completion. Their study confirmed that such mechanisms significantly improved college students' classroom engagement and academic performance.

Despite this success, studies on gamified teaching at the junior high schools remain underexplored in the context of English teaching of China. Research by Lopez and Tucker (2019) confirmed the potential of gamified elements to enhance student engagement in K-12 education, particularly across activities featuring storytelling and quest-based learning. However, this study was primarily conducted in developed regions with well-established educational resources. The scarcity of studies on gamified teaching in secondary education, especially in regional contexts with limited resources, represents a critical gap. Conducting systematic studies in these areas is essential for fully realizing gamified teaching's potential in diverse educational ecosystems.

3.2 Application of the Technology Acceptance Model in Education

The Technology Acceptance Model (TAM), developed by Davis (1989), remains one of the most robust and extensively used frameworks for understanding users' acceptance and adoption of new technologies. The model posits that perceived usefulness (PU) and perceived ease of use (PEOU) are the two elementary variables influencing individuals' attitudes toward technology and their intention to use it. TAM has been particularly influential in educational contexts, where it has been used to predict both teachers' and students' acceptance of technological tools. In the field of education, the work of Abdullah and Ward (2016) provided an extensive meta-analysis that validated TAM's effectiveness in predicting learners' willingness to adopt educational technologies. Their findings revealed that perceived usefulness was the strongest determinant of students' behavioral intention, followed by perceived ease of use, across various educational tools like learning management systems, online platforms, and digital classroom tools. Research focusing on the effectiveness of TAM in gamified teaching is essential for understanding the unique challenges and benefits associated with combining technology with game-based learning.

By merging latest findings from TAM and studies in gamified teaching, this research has the opportunity to address a major research gap. Investigating how TAM predicts acceptance of gamification technologies at the secondary education level, particularly in resource-constrained areas such as Western Guangdong, is key to promoting educational modernization and informatization.

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3.3 Research Gaps

A comprehensive review of the existing literature reveals several critical gaps that warrant further investigation. First, while substantial research highlights the effectiveness of gamified teaching in higher education, there is a significant lack of studies focusing on its application at the elementary education level. The unique developmental, cognitive, and motivational needs of middle school students require tailored approaches to gamified teaching, which have not been sufficiently explored in existing research. The majority of current studies have been conducted in well-resourced or developed regions, leaving a gap in our understanding of how gamified teaching may function in areas with limited educational resources. The lack of regional studies, particularly empirical research on underprivileged areas, means there is little evidence on how gamification strategies can be adapted to benefit schools in rural or resource-constrained environments. This is especially relevant in regions like Western Guangdong, where localized challenges such as limited infrastructure, teacher training, and access to technology must be addressed. While TAM has been extensively used to predict the adoption of general educational technologies, its potential to explain teachers' and students' acceptance of gamified learning tools, particularly at the elementary education level, remains underexplored. This gap highlights the need for innovative research that combines the TAM framework with gamification theories to address adoption barriers and optimize implementation strategies. Therefore, research questions are formulated as follows:

RQ1: What is the impact of gamified teaching, using Khan Academy, on students' English proficiency compared to traditional teaching methods?

RQ2: How does the use of gamified teaching tools affect students' learning motivation and classroom engagement in English lessons?

RQ3: To what extent do perceived usefulness and ease of use of the Khan Academy app correlate with improvements in students' academic performance?

4. Methodology

4.1 Research Design

This study utilized a quasi-experimental design to evaluate interventions. Two parallel classes from a junior high school in Maoming, a city in western Guandong, were selected to participate: the experimental group (60 students) and the control group (60 students). This design allowed for a controlled comparison of educational outcomes between groups exposed to different teaching methods. The experimental group implemented a gamified teaching approach by integrating Khan Academy, a mature gamification-based learning platform (Figure 1), into their English lessons. Specific tools such as engaging environment, interactive games, dynamic feedback and immersive educational experience were incorporated into their curriculum to enhance engagement and align with the principles of gamified pedagogy. Meanwhile, the control group continued with traditional teaching methods, relying on conventional instructional strategies such as teacher-led lectures, rote practice, and textbook-focused learning.

Figure 1: Screenshot of Khan Academy Kids APP Interface

The experiment spanned 8 weeks, providing sufficient time to capture meaningful changes in students' English learning outcomes, motivation, and classroom engagement. Pre-tests and post-tests

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were conducted to measure improvements in English proficiency across skill areas such as listening, reading, and writing. In addition to quantitative testing, questionnaires and interviews were employed to collect data on more subjective aspects like students' learning motivation and behavioral engagement. This mixed-methods approach ensured the collection of both objective performance data and qualitative insights, creating a comprehensive view of gamified teaching's impact at the junior high school.

4.2 Research Instruments

The instruments used in this study were carefully chosen to measure key variables with validated reliability and internal consistency.

4.2.1 Technology Acceptance Questionnaire

This questionnaire was developed to measure students' attitudes toward the gamified teaching tools used in the experimental group. Specifically, it assessed perceived usefulness (PU) and perceived ease of use (PEOU), core constructs of the Technology Acceptance Model (TAM). The high Cronbach's alpha (0.87) indicates strong reliability, demonstrating that the questionnaire effectively captures students' subjective evaluations of the gamified teaching platform. Examples of items include statements like "*The gamified app helps me learn English more interestingly and efficiently*" (PU) and "*The interface of the app is clear and easy to navigate*" (PEOU). These dimensions helped explore the relationship between students' attitudes toward gamified teaching and their academic performance.

4.2.2 Learning Motivation Questionnaire and Classroom Engagement Observation Scale

To measure the impact of gamification on student behavior and emotional engagement, this study employed a Learning Motivation Questionnaire and a Classroom Engagement Observation Scale tailored for secondary level students. Both tools demonstrated high internal consistency, with Cronbach's alpha values of 0.85 and 0.83, respectively. The motivation questionnaire assessed elements of intrinsic motivation (e.g., enjoyment of learning activities) and extrinsic motivation (e.g., working for rewards), while the engagement scale focused on observable classroom behaviors, such as participation in discussions, attention during lessons, and collaborative group activities. These instruments captured both the psychological and behavioral dimensions of student engagement, providing a nuanced understanding of how gamified teaching influenced students' habits and attitudes.

4.2.3 English Learning Outcome Assessment

To evaluate changes in English proficiency, a comprehensive assessment was designed to cover all four language skills: listening, speaking, reading, and writing. This assessment was based on final English exams, ensuring alignment with the school's curricular standards and the students' regular academic expectations. Items included listening comprehension questions, reading passages with multiple-choice questions, guided writing prompts, and short oral responses. Pre-test scores provided a baseline of proficiency, while post-test scores measured progress after the 8-week intervention. This ensured reliable and comparable data across both experimental and control groups.

4.3 Data Collection and Analysis

This research employed a mixed-methods approach to data collection and analysis, integrating both quantitative and qualitative methodologies to ensure comprehensive understanding of the gamified teaching intervention's effects. The methodological triangulation enhanced the validity and reliability of the findings while providing rich insights into the complex dynamics of technology-enhanced language learning in the Western Guangdong context.

The quantitative data analysis utilized SPSS 29.0 for statistical processing, implementing a rigorous analytical framework. Preliminary analyses included tests for normality (Shapiro-Wilk test) and homogeneity of variance (Levene's test) to ensure the appropriateness of parametric statistical procedures. These analyses provided foundational insights into patterns within the dataset, particularly regarding English proficiency scores, motivation indices, and technology acceptance metrics. Subsequently, inferential statistical analyses were conducted to test the research hypotheses.

The quantitative findings were complemented by thematic analysis of qualitative data, following Braun and Clarke's (2006) six-phase approach. This analysis revealed recurring patterns in student and teacher experiences, providing crucial context for interpreting the statistical results. The integration of quantitative and qualitative findings through a convergent parallel design enabled a nuanced

ISSN 2522-6398 Vol. 8, Issue 2: 41-50, DOI: 10.25236/FER.2025.080207

understanding of how gamified teaching interventions influence language learning outcomes in resource-constrained educational settings.

5. Results and Analysis

5.1 Quantitative findings

5.1.1 Learning Outcomes

RQ1 "*What is the impact of gamified teaching on students' English proficiency compared to traditional teaching methods?*" The results of the pre-test and post-test indicate that the progress scores (18.5) of the experimental group were significantly higher than those (9.1) of the control group ($F=15.67$, $p<.001$) as shown in Figure 2. Students in the experimental group who received gamified teaching showed notable improvement, particularly in English listening and reading, and also demonstrated advancements in written expression skills.

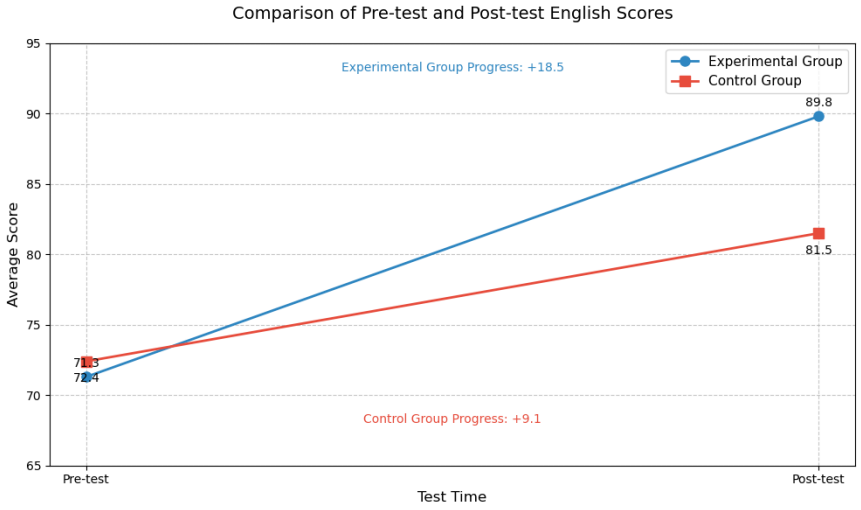

Figure 2: Comparison of Pre-test and Post-test English Scores

5.1.2 Technology Acceptance Results

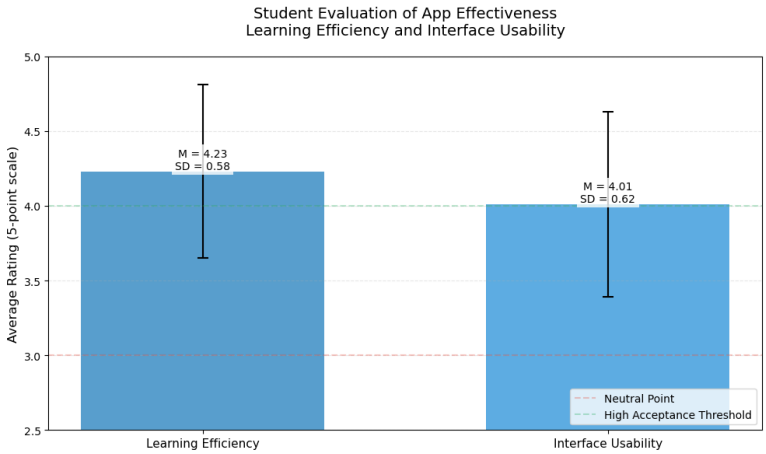

Figure 3: Student Technology Acceptance Ratings

To effectively visualize and analyze the technology acceptance data for the Khan Academy app, we implemented a comprehensive bar chart visualization (Figure 3). The analysis revealed compelling evidence of strong positive acceptance across two primary dimensions of technology assessment. In terms of learning efficiency, students reported a notably high mean score of 4.23 (SD = 0.58) on a five-point scale, demonstrating their strong conviction that the app significantly enhanced their learning process. The relatively small standard deviation indicates consistent positive responses across the student population, suggesting widespread agreement regarding the app's educational benefits.

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Similarly, the interface usability dimension received highly favorable evaluations, with students reporting a mean score of 4.01 (SD = 0.62). This score reflects participants' positive evaluation of the app's intuitive design and user-friendly interface.

5.1.3 Learning Motivation and Engagement

RQ2 "*How does the use of gamified teaching tools affect students' learning motivation and classroom engagement in English lessons?*" The results of questionnaire show that the experimental group significantly outperformed the control group in learning motivation and classroom engagement (Figure 4). Learning motivation scores for the experimental group were significantly higher (M=4.12, p<.01) compared to the control group (M=3.45). Similarly, classroom engagement scores also showed significant improvement (M=4.05, p<.01). The integration of dynamic feedback mechanisms greatly stimulated students' competitiveness and intrinsic motivation. Classroom observations also revealed that students in the experimental group participated more actively in answering questions and collaborative learning activities.

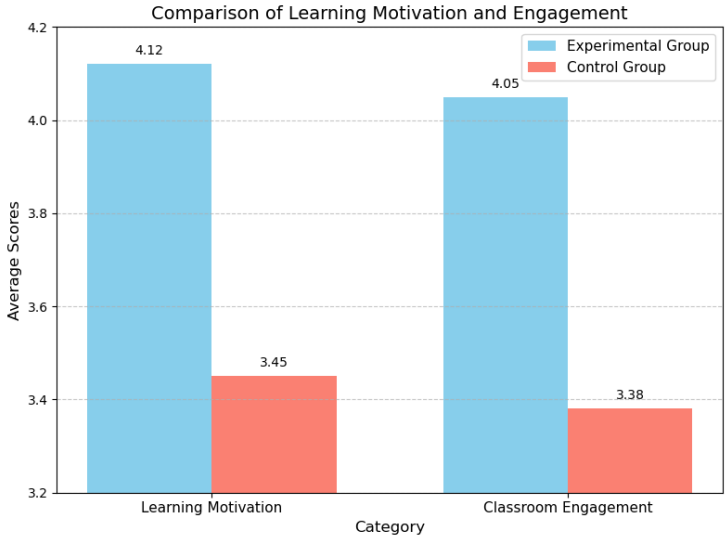

Figure 4: Comparison of Learning Motivation and Engagement

5.1.4 Correlation between technology acceptance and academic performance

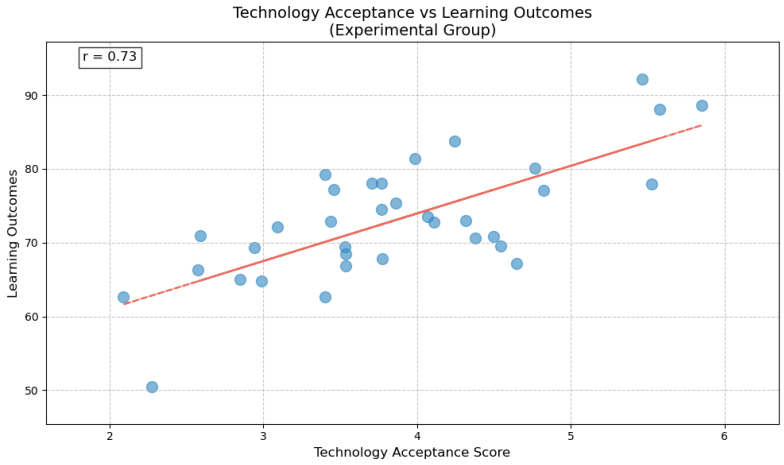

Figure 5: Correlation between Technology Acceptance and Learning Outcomes

RQ3 "To what extent do perceived usefulness and ease of use of the Khan Academy app correlate with improvements in students' academic performance?" A significant positive correlation was observed between technology acceptance and learning outcomes (r=0.73, p<.01), indicating that students who found the app more useful and easier to use achieved better learning outcomes (Figure 5). The relationship between technology acceptance and learning outcomes revealed a compelling pattern of association that warrants detailed examination. Statistical analysis demonstrated a robust positive correlation between students' acceptance of the Khan Academy app and their subsequent learning

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achievements, representing a strong and statistically significant relationship between these variables.

5.2 Qualitative Findings

Six participants from the experimental groups were randomly chosen to conduct a semi-structure interview at the end of intervention. The qualitative data analysis employed a systematic thematic analysis approach following Braun and Clarke's (2006) six-phase framework, which revealed several significant patterns in both student and teacher experiences with the gamified learning platform.

5.2.1 Student Perspectives

① Enhanced learning motivation: Students consistently reported increased motivation through gamification elements. As one participant noted: "*The points system makes me want to complete more exercises.*" Another student excitedly shared her feelings " *It's so exciting when I earn those badges and get little surprises- it turns studying into something fun! And whenever my virtual pet gets a treat because I did well, it just makes me feel awesome about my progress!*" This intrinsic motivation aligns with Self-Determination Theory's emphasis on competence and autonomy.

② Self-paced learning benefits: Students appreciated the flexibility to progress at their own pace, particularly evident in their feedback during focus group discussions. A representative comment from a student highlighted: "*I can review difficult parts multiple times without feeling pressured, especially for listening exercises*." Another student commented "*I can actually see how much I've learned from the progress bar, and it makes me feel like I'm getting better day by day. Plus, it really keeps me going because I can see exactly how close I am to finishing each level!*" This autonomy in learning pace contributed to reduced anxiety and increased confidence in English learning.

③ Peer learning dynamics: Observational data indicated the emergence of spontaneous peer support networks. Students frequently engaged in collaborative problem-solving, sharing strategies for navigating the platform. Field notes documented instances of more technologically proficient students voluntarily assisting their peers, fostering a collaborative learning environment.

5.2.2 Teacher Experiences

Analysis of teacher interviews and reflective journals identified three major themes.

① Professional development journey: Teachers described a transformative process in their teaching approach. Initial apprehension about technology integration gradually evolved into confidence and innovation. The teacher reflected: "*At first, I was worried about managing the technical aspects, but now I can focus on creating more engaging lessons using the platform's features*."

② Pedagogical adaptation: Teachers reported developing innovative strategies to integrate gamified elements with traditional teaching methods. Classroom observations documented successful hybridization of approaches, such as combining digital rewards with physical classroom activities. A veteran teacher noted: "*I've learned to use the platform's data to identify struggling students and provide targeted support*."

③ Resource management: Teachers developed efficient strategies for managing technical resources and class time. Analysis of lesson plans and teacher journals revealed systematic approaches to balancing screen time with traditional activities, addressing a key concern in middle schools settings.

6. Discussion

6.1 Key Findings

This study confirms that the Khan Academy app significantly enhances students' English learning interest and classroom engagement through its interactive digital platform. Gamified teaching elements, such as virtual gifts, achievement badges, progress tracking, and competitive leaderboards, effectively motivate students, particularly those who traditionally show hesitance or reluctance in conventional classroom settings. The immediate feedback and reward system creates a positive learning environment where students feel encouraged to participate more actively and consistently in their learning journey.

Additionally, technology acceptance plays a critical role in influencing teaching outcomes, with students reporting high satisfaction with the app's usability and functionality. The intuitive interface

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design, coupled with personalized learning paths and adaptive content delivery, contributes to a seamless learning experience. Students particularly appreciated the app's accessibility, which allows them to learn at their own pace and review materials as needed. The study also reveals that students who showed higher levels of technology acceptance demonstrated better learning outcomes, suggesting that familiarizing students with educational technology tools before implementation could be beneficial for maximizing learning effectiveness.

6.2 Implications

To effectively promote gamified English language teaching in secondary education, a focus on enhancing teacher capabilities, tailoring design to local needs, and establishing strong evaluation systems is essential. Providing comprehensive teacher training is crucial for improving educators' ability to integrate technology into classrooms, ensuring they are equipped not only with technical skills but also with pedagogical strategies for deploying gamified tools effectively. Gamified teaching designs should also be optimized to suit local educational contexts, incorporating content that reflects cultural relevance and the specific learning needs of students. By aligning the design with regional characteristics and educational goals, gamification becomes more meaningful and accessible for students. Furthermore, introducing robust evaluation and feedback mechanisms is essential for monitoring the effectiveness of gamified teaching methods. Regular assessments of progress and engagement, combined with actionable feedback for teachers and students, can help refine strategies to maximize learning outcomes over time.

7. Conclusion

This study highlights the potential and feasibility of gamified teaching as a valuable pedagogical approach for improving English learning outcomes at the elementary education stage in western Guangdong. By integrating the gamified features of Khan Academy into English lessons, the study demonstrated substantial improvements in student motivation, engagement, and academic performance. Notably, students in the experimental group achieved significantly higher gains in listening, reading, and writing skills compared to those taught using traditional methods. These findings align with the growing body of global research that supports the effectiveness of gamified teaching in fostering deeper learning and creating an engaging classroom environment. Moreover, this study's results carry important implications for regions with limited educational resources, providing practical insights on how gamification and technology acceptance principles can drive educational innovation even in resource-constrained settings. By bridging the gap between theoretical frameworks like the Technology Acceptance Model (TAM) and the practical deployment of gamified teaching tools at the secondary level, this research contributes to the broader goals of educational informatization and modernization in underserved areas.

The study's scope was limited in certain aspects that suggest exciting avenues for future research. For instance, expanding the sample size to include a more diverse and representative population across different schools in rural and urban settings could enhance the generalizability of the findings. By including schools with varying access to technology and educational resources, future studies could refine and validate strategies for scaling gamified teaching across varied contexts. Additionally, the study primarily focused on short-term outcomes such as learning motivation, engagement, and performance over a 8-week intervention. Future research should aim to investigate the long-term effects of game-based teaching interventions on academic achievement and skill retention. Examining how sustained exposure to gamification pedagogy impacts students' English language proficiency, critical thinking skills, and attitudes toward learning over several academic years could provide deeper understanding of its enduring benefits.

In conclusion, this study serves as a significant step forward in demonstrating how gamified teaching can transform elementary education, level up EFL students' English learning outcomes, and contribute to the broader goals of educational modernization. Building on these findings through more expansive and longitudinal research will strengthen the case for scalable gamification interventions, ensuring that all learners, regardless of their regional or resource limitations, benefit from innovative and engaging educational practices.

ISSN 2522-6398 Vol. 8, Issue 2: 41-50, DOI: 10.25236/FER.2025.080207

Acknowledgment

This study was funded by the U-G-S Foreign Language Education Teaching and Research Community Project of the School of Foreign Studies at Lingnan Normal University, titled "*Innovative Practices in Gamified English Teaching Reform at the Junior High Schools in Western Guangdong* ".

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