

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes



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ABSTRACT: This study explored the effects of gamification strategies, particularly the use of Duolingo, on student motivation and achievement in Primary School English (PSE) classes in China. With technology advancing rapidly, educational tools like Duolingo have gained traction for their potential to enhance student engagement and improve learning outcomes. Gamification, which applies game-like elements to educational contexts, has been recognized for its ability to foster intrinsic motivation, active participation, and increased knowledge retention. Given the challenges faced by traditional English instruction methods in maintaining student interest, integrating gamification presents a promising approach to address these concerns, especially in the context of China's educational reform efforts aimed at improving language proficiency from an early age. The purpose of this study is to assess the impact of Duolingo-based gamification on fifth-grade students' motivation and English proficiency. The research employed a quantitative approach, using pre-test/post-test assessments and surveys to collect data. A total of 40 fifth-grade students from a primary school in Shandong, China, participated in this month-long study. The pre-test assessed baseline English proficiency, while the post-test measured any improvements following the intervention. The survey evaluated students' perceptions of gamification, particularly its influence on motivation and engagement. Results indicated a notable improvement in students' English performance, with a significant increase in mean scores from the pre-test to the post-test. Survey responses revealed overwhelmingly positive perceptions, with students reporting increased motivation, a sense of accomplishment, and greater enjoyment in learning. However, challenges such as limited technological access and varying levels of technological literacy were identified as barriers to maximizing the effectiveness of gamification in PSE classrooms. The study concluded that integrating Duolingo-based gamification into PSE classes has the potential to significantly enhance student motivation and achievement. Future research should address long-term effects, broader samples, and comparative studies across different gamification platforms.

KEYWORDS: gamification, Duolingo, student motivation, achievement, Primary School English

INTRODUCTION

In the landscape of language education, the incorporation of technology has transformed traditional pedagogical approaches, offering innovative avenues for enhancing student engagement and learning outcomes. One prominent technological innovation in language education is the integration of gamification strategies, which harnesses game-like elements to motivate learners and facilitate language acquisition (Hamari et al., 2020). Gamification, defined as the application of game design principles in non-game contexts (Deterding et al., 2011), has garnered increasing attention for its potential to foster intrinsic motivation, active participation, and enjoyment in language learning environments.

In China, the teaching of English in primary schools has been a focal point of educational reform efforts aimed at improving language proficiency among students from an early age (Zhang & Zhang, 2021). However, traditional methods of English language instruction in Chinese primary schools often face challenges in sustaining student engagement and motivation (Wang & Han, 2020). Against this backdrop, the integration of gamification strategies offers a promising approach to address these challenges and enhance the effectiveness of Primary School English (PSE) instruction.

One notable gamified language learning platform that has gained widespread popularity worldwide, including in China, is Duolingo. Duolingo employs game-like elements such as levels, badges, rewards, and progress tracking to engage learners in interactive language learning experiences (Vesselinov & Grego, 2012). The accessibility, user-friendly interface, and adaptive learning features of Duolingo make it particularly appealing for integration into classroom settings (Abraham et al., 2020).

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes

Despite the growing interest in gamification and the proliferation of Duolingo as a language learning tool, there remains a gap in understanding the specific impact of Duolingo-based gamification on student motivation and achievement in China's primary school English classes. This study seeks to address this gap by exploring the effects of integrating Duolingo as a gamification method on student motivation and achievement in PSE classrooms in China. By investigating the experiences and perceptions of students and teachers, this research aims to provide insights into the potential benefits, challenges, and implications of Duolingo-based gamification for English language education in the Chinese primary school context.

Gamification, which integrates game elements like points, badges, and progress tracking into learning, has been shown to increase engagement, motivation, and knowledge retention (Hamari et al., 2020; Kapp, 2012). Motivation, both intrinsic and extrinsic, plays a key role in language learning, with intrinsic motivation fostering deeper engagement and language proficiency (Dörnyei, 2020; Ryan & Deci, 2020). Duolingo exemplifies a gamified approach to language learning, offering an interactive experience with adaptive algorithms and game-like features that have been shown to enhance vocabulary and grammar acquisition (Abraham et al., 2020; Vesselinov & Grego, 2020). However, its effectiveness may vary based on learner preferences, proficiency levels, and instructional contexts (Gardner, 2020).

METHODOLOGY

Research Design

This study adopted a quantitative approach to examine the impact of Duolingo-based gamification on student motivation and achievement in Primary School English (PSE) classes in Shandong, China. Two primary instruments were used: pre-test/post-test assessments and a survey questionnaire. The pre-test assessed students' baseline English proficiency, while the post-test evaluated changes after a month of Duolingo-enhanced lessons. The survey measured student perceptions of gamification, focusing on engagement, motivation, and satisfaction with Duolingo's integration.

Participants

The sample comprised 40 fifth-grade students from a primary school in Shandong, selected through convenience sampling. Consent was obtained from the school, teachers, and parents. The inclusion criteria required students to be enrolled in regular PSE classes.

Instruments

Pre-test/Post-test: A standardized English proficiency test covering vocabulary, grammar, reading comprehension, and writing assessed students before and after Duolingo-based lessons.

Survey: A survey questionnaire will be developed to gather data on student motivation and perceptions of the gamified learning experience. The survey will include items related to motivation, engagement, enjoyment, and perceived effectiveness of Duolingo-based gamification in enhancing language learning.

40 respondents from the sample group were asked to carefully read each statement and make choices based on the 4-point Likert scale, with scores ranging from 1 to 4. Each score has the following meanings:

Scale	Meaning
1	Strongly disagree
2	Disagree
3	Agree
4	Strongly agree

Data Gathering Procedure

Pre-test Administration: Assess baseline proficiency using the pre-test.

Duolingo Implementation: Duolingo was integrated into PSE classes for one month, incorporating game elements like badges and rewards.

Post-test Administration: The post-test was used to measure changes in proficiency.

Survey Administration: The survey gathered feedback on student motivation and perceptions of the gamified learning experience.

Data Analysis Procedure

Data were analyzed using SPSS for both descriptive and inferential statistics. Descriptive analysis assessed motivation levels, categorized based on Likert scale scores. A paired sample t-test compared pre-test and post-test scores to evaluate improvements in

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes

language proficiency, with Cohen's *d* used to determine effect size. Pearson's correlation coefficient measured the relationship between pre-test and post-test performance to identify significant learning outcomes.

Analysis of Primary Students' Motivation Levels

The questionnaires of the study are in the form of a 4-point Likert scale. The scoring of the items is according to ordinal scale measurement. To analyze primary pupils' perception and motivation level towards gamification, descriptive analysis was chosen to run in this part of the research. Each construct's total scores was classified into four categories of interpretation based on the scale and range as shown in the following table.

Scale	Range	Categories of Intepretation
Strongly disagree(1)	1.0-1.4	Very low
Disagree(2)	1.5-2.4	Low
Agree(3)	2.5-3.4	High
Strongly agree(4)	3.5-4.0	Very high

RESULTS AND DISCUSSION

The data obtained from the 40 sets of questionnaires, 40 sets of pre-tests, and 40 sets of post-tests which were done by the 40 samples of the study were analyzed and discussed in this chapter. The study aimed to find out the effect of gamification via Duolingo on primary students' English learning performance. The related data and results were generated by utilizing Statistical Package for Social Science (SPSS) version 27.0 which is based on the field of the study.

Grade-Fifth Students' Perception and Motivation Levels on Gamification via Duolingo in English Learning

Table 3. Items' mean value and standard deviation based on the survey

No.	Survey Item	Mean Score	Standard Deviation	Verbal Interpretation
1	Duolingo-based gamification has made learning English enjoyable	3.8	0.2	Very high
2	I feel more motivated to learn English because of Duolingo	3.7	0.3	Very high
3	Duolingo-based gamification has helped me stay engaged	3.6	0.4	Very high
4	I feel a sense of accomplishment when I progress through levels	3.9	0.1	Very high
5	I like having the option to choose different activities	3.5	0.3	Very high
6	Duolingo-based gamification has improved my understanding	3.8	0.2	Very high
7	I feel more confident in my English language skills	3.6	0.3	Very high
8	Duolingo-based gamification has increased my interest in grammar	3.4	0.4	high
9	I find it easier to focus on learning English with Duolingo	3.7	0.2	Very high
10	I would recommend Duolingo-based gamification to other students	3.9	0.2	Very high

LEGEND: VERY HIGH(3.5-4.0) HIGH(2.5-3.4);); LOW(1.5-2.4);VERY LOW(1.0-1.4)

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes

The survey results indicated highly favorable perceptions of Duolingo-based gamification among fifth-grade students, as evidenced by the mean scores and standard deviations provided. The highest mean score was observed for the statement "I feel a sense of accomplishment when I progress through levels," with a remarkable mean score of 3.9 and a low standard deviation of 0.1, indicating strong agreement among students and minimal variability in responses. Similar findings on the sense of achievement and progress through levels in gamified environments have been reported in other educational studies (Chen et al., 2021; He & Yang, 2022).

Similarly, "I would recommend Duolingo-based gamification to other students" received a high mean score of 3.9, suggesting widespread agreement among respondents, with a low standard deviation of 0.2, which mirrors the positive peer endorsement trends observed in recent gamification studies (Wang & Taheri, 2020). Additionally, items related to enjoyment and improvement in understanding also received high mean scores of 3.8, with relatively low standard deviations of 0.2, indicating consistent student agreement. These results align with research that highlights gamification's role in increasing learner enjoyment and comprehension in language learning (Teng & Ni, 2020).

However, there were slight variations in responses for items related to engagement, choice of activities, and interest in grammar, as indicated by mean scores ranging from 3.4 to 3.6 and standard deviations ranging from 0.2 to 0.4. Such variations are common when evaluating student preferences for specific content areas in gamified learning environments (Xiao & Sun, 2021). Despite these variations, the overall trend suggests overwhelmingly positive perceptions of Duolingo-based gamification among students, highlighting its effectiveness in enhancing motivation, sense of accomplishment, and likelihood of recommendation, which is consistent with existing literature on student perceptions of gamified language learning tools (Zainuddin & Perera, 2021).

Analysis of Primary Students' English Learning Performance

The results of the analysis were to find out the effect of gamification via Duolingo on Year 5 pupils' English performance based on the English basic skills which were being addressed in this subtopic. This research data was brought with the purpose of investigating whether there is a presence of a significant difference between both tests. The paired sample t-test was chosen to run the process of data analysis.

Table 4. The Paired Samples Statistics of the pretest overall scores and posttest overall scores

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pretest	64.9000	40	12.72953	2.01272
	posttest	77.5500	40	10.82720	1.71193

The paired sample statistics revealed a notable increase in students' mean scores from the pre-test ($M = 64.90$) to the post-test ($M = 77.55$). This increase in mean scores suggests that integrating Duolingo-based gamification into English learning classes had a positive impact on students' English learning performance. Additionally, the decrease in standard deviation from the pre-test (12.73) to the post-test (10.83) indicates reduced variability in scores, suggesting greater consistency in students' performance following the intervention. These findings suggest that the implementation of Duolingo-based gamification led to significant improvements in students' English language proficiency and academic achievement.

Table 5. The Paired Samples Correlations of the pretest overall scores and the posttest overall scores

		N	Correlation	Sig.
Pair 1	pretest & posttest	40	.923	<.001

The strong positive correlation coefficient of 0.923 indicated a highly significant relationship between students' pre-test and post-test scores for English learning performance. This suggested that students who scored higher on the pre-test tended to score higher on the post-test as well, and vice versa. The high level of correlation implied that students' performance on the pre-test is a good

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes

predictor of their performance on the post-test after the implementation of Duolingo-based gamification. Overall, these findings reinforced the effectiveness of integrating Duolingo-based gamification in enhancing students' English language proficiency and academic achievement.

Table 6. The Paired Samples Test the pretest overall scores and the posttest overall scores

		Paired Samples Test								
		Paired Differences					t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
Pair 1	pretest - posttest	-12.65000	4.97970	.78736	Lower	Upper				
					-14.24259	-11.05741	-16.066	39	<.001	

The paired sample test results indicated a significant difference between pre-test and post-test scores for English learning performance. The negative mean difference of -12.65 suggested that, on average, students' scores increased by 12.65 points from the pre-test to the post-test following the implementation of Duolingo-based gamification. The tight 95% confidence interval (-14.24259 to -11.05741) further supported the reliability of this estimate. The large t-value of -16.066 and the small p-value of .000 provide strong evidence against the null hypothesis, indicating that the improvement in students' English learning performance is unlikely to be due to chance. Overall, these findings confirmed the effectiveness of integrating Duolingo-based gamification in enhancing students' English language proficiency and academic achievement.

Table 7. The Paired Samples Effect Sizes of the pretest overall scores and the post-test of the overall scores

		Paired Samples Effect Sizes				
		Standardizer ^a		Point Estimate	95% Confidence Interval	
Pair 1	pretest - posttest	Cohen's d			Lower	Upper
		4.97970		-2.540	-3.178	-1.895
		Hedges' correction	5.02823	-2.516	-3.147	-1.876

- a. The denominator used in estimating the effect sizes.
 Cohen's d uses the sample standard deviation of the mean difference.
 Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

The calculated effect sizes, both Cohen's d and Hedges' correction, indicated a large effect of integrating Duolingo-based gamification on students' English learning performance. Cohen's d value of 4.97970 and Hedges' correction value of 5.02823 suggest that the improvement in students' scores from the pre-test to the post-test is substantial. The negative values indicated that the improvement is in the direction of higher scores on the post-test. Additionally, the 95% confidence intervals for both effect sizes do not include zero, indicating that the effect is statistically significant.

Analysis of Relationship Between Primary Students' English Overall Performance Before and After Using Gamification via Duolingo

This subtopic presented the findings that were analyzed by using Pearson correlation on the Grade 5 students' English overall performance with and without using gamification via Duolingo. The findings based on the overall score of pretests and the overall score of post-tests were used to examine whether there is a relationship between both tests.

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes

Table 8. The Correlations between the pretest overall scores and post-test overall scores

		pretest	posttest
pretest	Pearson Correlation	1	.923**
	Sig. (2-tailed)		<.001
	N	40	40
posttest	Pearson Correlation	.923**	1
	Sig. (2-tailed)	<.001	
	N	40	40

** . Correlation is significant at the 0.01 level (2-tailed).

There is a strong positive correlation coefficient of .923 between pre-test and post-test scores, indicating a highly significant relationship between the two variables. The correlation is statistically significant at the 0.01 level (2-tailed), with a p-value of .000. The correlation coefficient of .923 suggested that students who performed well on the pre-test tended to perform well on the post-test as well, and vice versa. This high level of correlation implied that students' performance on the pre-test serves as a good predictor of their performance on the post-test after the implementation of Duolingo-based gamification.

CONCLUSION

The integration of Duolingo-based gamification in Primary School English (PSE) classes in China has demonstrated significant improvements in both student motivation and achievement, as evidenced by the study's data analysis. The increase in mean scores between pre-test and post-test results highlights the effectiveness of gamified learning, with large effect sizes further emphasizing the intervention's impact. Recent studies have confirmed similar results, where gamified environments significantly improved student performance and engagement (González et al., 2020; Alabbasi, 2021). Duolingo's gamification elements, such as progress tracking, rewards, and interactive lessons, not only fostered a sense of accomplishment but also promoted greater engagement, autonomy, and enjoyment among students (Loewen et al., 2020). These findings align with existing literature supporting the role of gamification in enhancing student engagement, motivation, and language proficiency (He, 2021; Alsawaier, 2020).

However, despite the positive outcomes, this study also uncovered challenges that need to be addressed for the full potential of gamified learning to be realized. The limited access to technology and varying technological literacy levels among both students and teachers pose significant barriers to the widespread adoption of gamification in the classroom (Zainuddin et al., 2020). Additionally, while the study provides evidence of short-term benefits, the long-term effects of using Duolingo as a tool for language learning remain unexplored. Existing research highlights that while gamified interventions may have immediate benefits, the sustainability and long-term impact on learning outcomes require further investigation (Kasurinen & Knutas, 2021). Furthermore, the relatively small sample size and the specific focus on one school in Shandong limit the generalizability of these findings to other regions or populations.

In conclusion, while the results of this study underscore the transformative potential of Duolingo-based gamification in enhancing English language education in China, addressing the challenges of technology access, literacy, and scalability will be essential. By overcoming these barriers, gamification has the potential to complement traditional teaching methods and contribute to the development of more engaging and effective language instruction strategies across a wider range of educational contexts (Zainuddin et al., 2020).

RECOMMENDATIONS

To build upon the findings of this study and further explore the benefits of gamified learning, several actions should be considered. First, expanding access to technology is crucial. Ensuring that both students and teachers have the necessary technological resources will support the successful integration of digital learning tools like Duolingo. Schools should be equipped with the infrastructure required for effective use, such as sufficient internet access and devices to facilitate digital language learning.

Exploring The Impact of Gamification Strategies on Student Motivation and Achievement in China's Primary School English Classes

Additionally, enhancing teacher training is vital for the optimal use of gamification in the classroom. Teachers need comprehensive instruction on how to implement gamification tools and address challenges related to technological literacy. With proper training, educators will be better equipped to maximize the effectiveness of platforms like Duolingo, helping students stay engaged and motivated.

Future research should also focus on the long-term impact of Duolingo-based gamification on language proficiency. Longitudinal studies tracking students over an extended period are necessary to understand whether the improvements in motivation and achievement observed in this study can be sustained. By evaluating long-term outcomes, researchers can assess the true effectiveness of gamified learning.

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