การส่งเสริมการมีส่วนร่วมในการเรียนรู้และความสามารถในการเขียนเชิงวิชาการของนักศึกษาผ่านบทเรียนเกมมิฟิเคชันที่เน้นความท้าทาย

Enhancing Students' Learning Engagement and Academic Writing Ability through Challenge-Based Gamification Lessons

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(Received: Jul. 3, 2024; Revised: Oct. 22, 2024; Accepted: Oct. 25, 2024)

บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อ 1) ศึกษาระดับความสามารถในการเขียนเชิงวิชาการและการมีส่วนร่วมในการเรียนรู้ 2) เปรียบเทียบความสามารถในการเขียนเชิงวิชาการก่อนและหลังการใช้บทเรียนเกมมิฟิเคชันแบบท้าทาย 3) ตรวจสอบความสัมพันธ์ระหว่างความสามารถในการเขียนเชิงวิชาการและการมีส่วนร่วมในการเรียนรู้ระหว่างการใช้บทเรียนเกมมิฟิเคชันแบบท้าทาย และ 4) ประเมินความพึงพอใจของนักศึกษาต่อแนวทางการใช้เกมมิฟิเคชันแบบท้าทาย นักศึกษาชั้นปีที่ 2 จำนวน 65 คน จากมหาวิทยาลัยราชภัฏนครราชสีมาเข้าร่วมในรายวิชาเขียนเชิงวิชาการเป็นระยะเวลา 15 สัปดาห์ ในภาคการศึกษาแรกของปีการศึกษา 2565 ซึ่งมีการผนวกองค์ประกอบของการเล่นเกม เช่น การเก็บคะแนน กระดานผู้นำ และกิจกรรมความท้าทายรายสัปดาห์ การเก็บข้อมูลประกอบด้วย การทดสอบก่อนและหลังเรียนเกี่ยวกับความสามารถในการเขียน และการตอบแบบสอบถามเกี่ยวกับความพึงพอใจของนักศึกษา ผลการศึกษาแสดงให้เห็นถึงการพัฒนาความสามารถในการเขียนอย่างมีนัยสำคัญ โดยคะแนนหลังการทดสอบเพิ่มขึ้นจากค่าเฉลี่ย 7.76 เป็น 16.04 จากคะแนนเต็ม 25 คะแนน การมีส่วนร่วมในการเรียนรู้ ซึ่งสะท้อนผ่านคะแนนประสบการณ์ มีค่าเฉลี่ยอยู่ที่ 546.09 โดยมีคะแนนตั้งแต่ 96 ถึง 1,667 คะแนน ค่าสัมประสิทธิ์สหสัมพันธ์ของเพียร์สัน (r = 0.208) แสดงถึงความสัมพันธ์เชิงบวกระดับอ่อนระหว่างการมีส่วนร่วมในการเรียนรู้และความสามารถในการเขียน ซึ่งมีอิทธิพลต่อความแปรปรวนของผลลัพธ์การเขียนเพียง 4.31% นักศึกษาแสดงความพึงพอใจในระดับสูงต่อบทเรียนที่ใช้การเล่นเกม โดยเฉพาะในด้านความสำเร็จ คำแนะนำ และความสนุกสนาน ผลการค้นพบนี้บ่งชี้ว่าการการใช้บทเรียนเกมมิฟิเคชันแบบท้าทายมีประสิทธิภาพในการพัฒนาทักษะการเขียนเชิงวิชาการและส่งเสริมประสบการณ์การเรียนรู้ที่ดี

คำสำคัญ: การเขียนเชิงวิชาการ เกมมิฟิเคชัน การมีส่วนร่วมในการเรียนรู้ ความพึงพอใจของนักศึกษา

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ABSTRACT

The objectives of the study were to: 1) assess the level of academic writing ability and learning engagement; 2) compare academic writing ability before and after the use of challenge-based gamification lessons; 3) examine the relationship between academic writing ability and learning engagement during gamified lessons; and 4) determine student satisfaction with the challenge-based gamification approach. Sixty-five second-year students from Nakhon Ratchasima Rajabhat University participated in a 15-week Academic Writing course during the first semester of 2022, which included gamified elements such as points, leaderboards, and weekly challenges. Data collection involved pre-test and post-test assessments of writing ability and questionnaires on student satisfaction. Results showed a significant improvement in writing ability, with post-test scores increasing from an average of 7.76 to 16.04 out of 25. Learning engagement, as measured by experience points, averaged 546.09, ranging from 96 to 1,667 points. A Pearson correlation coefficient of 0.208 revealed a weak positive relationship between learning engagement and writing ability, accounting for 4.31% of the variance in writing outcomes. Students expressed high satisfaction with the gamified lessons, especially regarding achievement, guidance, and enjoyment. These findings indicate that challenge-based gamification is effective in enhancing academic writing skills and fostering a positive learning experience.

Keywords: Academic writing, Gamification, Learning engagement, Student satisfaction

Introduction

Writing is a core skill in higher education that profoundly impacts academic success and career preparedness. However, teaching academic writing poses a significant challenge for educators worldwide. Many students struggle with not only the mechanics of writing but also the ability to express critical and analytical thought in written form. These difficulties often stem from teaching approaches that fail to engage students effectively. A lack of motivation and engagement can result in poor writing outcomes, which can, in turn, hinder academic progress (Xu, Shi, Bos & Wu, 2023).

Gamification, defined as the application of game elements in non-game contexts, has gained traction in educational settings as a method to enhance student engagement and motivation (Hamari, Koivisto & Sarsa, 2014). Elements such as points, leaderboards, and challenges can transform routine academic tasks into dynamic, interactive experiences that promote active participation. In particular, challenge-based gamification-where learners are presented with progressively difficult tasks designed to stimulate cognitive and problem-solving skills-has shown promise in boosting learning outcomes. However, most research on gamification has focused on its application in STEM fields, with limited exploration of its impact on academic writing.

This study addresses this gap by investigating the impact of challenge-based gamification on students' academic writing ability. By incorporating elements such as point accumulation, leaderboards, and weekly writing challenges, the study aims to foster both writing skill development and learning engagement. The introduction of these gamified elements aligns with theories suggesting that structured, goal-oriented challenges can increase motivation and improve learning outcomes (Kapp, 2012).

Moreover, this research aligns with the increasing emphasis on student-centered learning in higher education, where active engagement and autonomous learning are prioritized. Challenge-based gamification offers a framework that allows students to take control of their learning process while providing the necessary scaffolding through immediate feedback, rewards, and collaborative activities. The integration of gamified learning is especially important in the context of modern higher education, where educators must find innovative ways to engage students in developing skills that are often perceived as difficult or uninteresting (Fredricks, Blumenfeld & Paris, 2004).

Research Questions

This study explores the following research questions:

1. What is the level of academic writing ability and learning engagement?
2. How does academic writing ability differ before and after the implementation of challenge-based gamification lessons?

3. What is the relationship between academic writing ability and learning engagement during the gamified lessons?

4. How satisfied are students with the challenge-based gamification approach to learning academic writing?

Research Objectives

This study has four main objectives:

1. To examine the level of academic writing ability and learning engagement.

2. To compare academic writing ability before and after the implementation of challenge-based gamification lessons.

3. To investigate the relationship between academic writing ability and learning engagement during the gamified lessons.

4. To examine student satisfaction with the challenge-based gamification approach to learning academic writing.

Scope of the Research

The population for this study comprises 65 students enrolled in academic writing courses during the first semester of the 2022 academic year at Nakhon Ratchasima Rajabhat University. The study employs a one-group pretest-posttest design.

Research Framework

The research identifies the following variables:

- Independent Variable: Challenge-based gamification lessons.
- Dependent Variables:
    1. Academic Writing Ability.
    2. Learning Engagement.
    3. Students' Satisfaction.

Methodology

1. Participants

The study involved 65 second-year undergraduate students enrolled in an Academic Writing course at Nakhon Ratchasima Rajabhat University during the first semester of the academic year 2022. Participants were selected using purposive sampling to ensure that the sample included students with a baseline level of writing ability and familiarity with basic academic writing concepts, making them suitable for evaluating the effectiveness of the challenge-based gamification approach. This sampling method was chosen to ensure that the participants were representative of the target population for which the intervention was designed. The sample size of 65 was deemed sufficient for meaningful statistical analysis of the study's outcomes, providing a balanced representation for the evaluation of both engagement and writing performance.

2. Research Instruments

The study used several research instruments:

2.1 Pre-test and Post-test (Academic Writing Ability Test): These tests assessed students' academic writing ability, focusing on structure, coherence, and grammatical accuracy. The development of the Academic Writing Ability Test involved several structured steps. Initially, the Bachelor of Arts in Business English program curriculum and related documents were reviewed to guide the test creation. The test required students to write an academic essay, including an outline and a draft, with open-ended responses assessed using a rubric. To ensure validity and reliability, the test underwent pilot testing with a sample group similar to the study population. Feedback was used to refine the instruments, and expert reviews ensured alignment with curriculum standards. The reliability of the test was measured using Cronbach's alpha, resulting in a value of 0.85, indicating high reliability. These steps ensured that the instruments accurately measured the intended outcomes and provided consistent results.

2.2 Engagement Tracking (Gamification Lessons): Points and levels earned in the gamification system were used as proxies for learning engagement.

The lessons were designed for online learning using Moodle LMS, incorporating gamification features such as points, leaderboards, and badges to

motivate students. Students completed weekly activities, including learning contents, doing exercises, and writing tasks in the online lesson. Each week, students were awarded points based on their completion of each task, which contributed to their leaderboard rankings. The gamification system tracked student progress, providing immediate feedback and visual indicators of achievement through level progression, as shown in Figure 1.

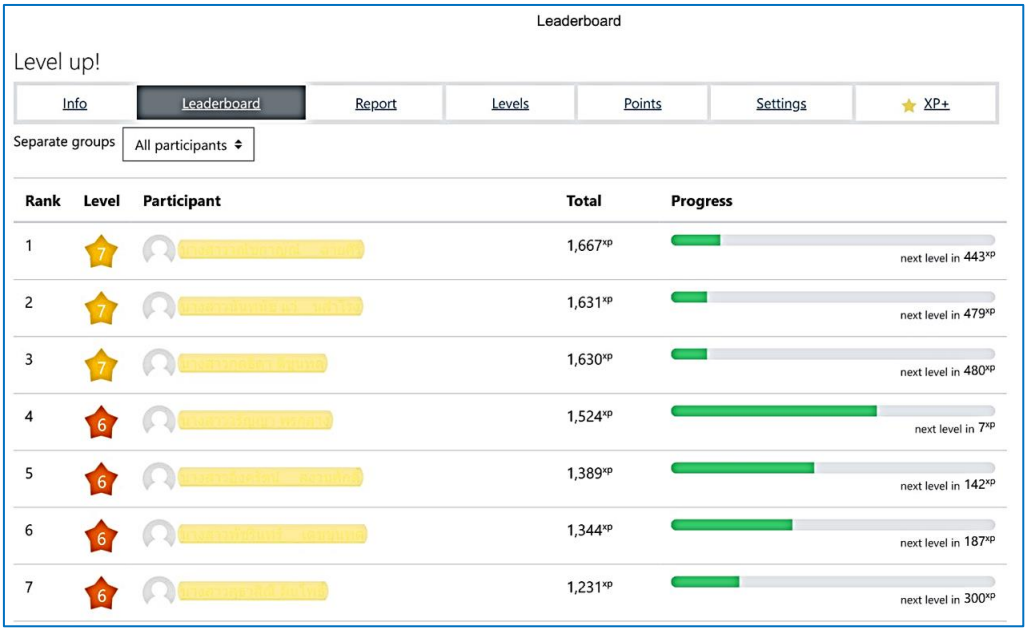

Figure 1 Visual indicators of achievement through level progression in the leaderboard

Students were required to do activities in the lessons each week. The accumulation of points was aligned with task completion, encouraging consistent engagement with lesson activities, as shown in Table 1.

Points accumulated by students are recorded as experience points, reflecting their engagement in the online course. The course is divided into 30 levels, with experience points required to progress based on an exponential increase, as specified by the Level Up system in the online course. See Table 2.

Table 1 Points for Activity Completion

Content/Activity	Task	Points
Course	Access the course	1
Content	View course webpage content	1
Activity	Open exercise, Start exercise, Submit answers, Complete exercise	1
Action	Create	3
	Read	2
	Update	1
	Delete	0

Table 2 Points Required for Each Level

Level	Points	Level	Points	Level	Points
1	0	11	5,114	21	75,620
2	120	12	6,769	22	98,426
3	276	13	8,919	23	128,074
4	479	14	11,715	24	166,616
5	742	15	15,350	25	216,720
6	1,085	16	20,074	26	281,856
7	1,531	17	26,217	27	366,533
8	2,110	18	34,202	28	476,613
9	2,863	19	44,582	29	619,717
10	3,842	20	58,077	30	805,753

Students' points and levels are displayed immediately upon completing activities, allowing them to track their progress. They can also view the leaderboard, which shows their scores and levels compared to their peers.

2.3 Questionnaire The opinion questionnaire was adapted from the Gameful Experience Questionnaire (GAMEFULQUEST) by Högberg, Hamari and Wästlund (2019), consisting of 56 items across seven dimensions: achievement, challenge, competition,

guidance, immersion, fun, and social experience. Each dimension has an acceptable level of convergent validity (≥0.5) and discriminant validity according to the Fornell–Larcker criterion. The questionnaire was adjusted by reducing the response scale from seven levels to five to suit the sample context, consolidating similar response options for simplicity, and translating the content from English to Thai to ensure clarity and accuracy in capturing students' opinions. The translated questionnaire was reviewed by three experts for content validity, language accuracy, and assessment correctness, using an Index of Item Objectives Congruence (IOC) evaluation. The IOC values were within the range of 0.67 to 1.00.

3. Data Collection

Data were collected over a 15-week period, during which students participated in both in-class and online writing activities. A pre-test was administered at the start of the course to assess baseline writing abilities. Weekly assessments were conducted to monitor progress, and a post-test was given at the end of the course to measure improvements in writing skills. Additionally, a questionnaire was administered to evaluate student satisfaction with the gamified lessons.

4. Data Analysis

The collected data were analyzed using several statistical methods. Pre- and post-test scores were compared using mean, standard deviation (S.D.), and dependent t-tests to determine significant differences. The relationship between academic writing ability and learning engagement was assessed using Pearson's correlation coefficient (r). Students' opinions on the gamification lessons were evaluated using mean ($\overline{X}$) and standard deviation (S.D.) from the questionnaire responses.

Research Results

This section presents the research results as follow.

1. The level of academic writing ability and learning engagement

The levels of academic writing are presented by the pretest and posttest scores, while the experience points represent learning engagement.

Table 3 Pretest-posttest scores and experience points

Test scores and Experience Points	$\overline{X}$	S.D.	Max	Min
Pretest score	7.76	4.82	22	1
Posttest score	16.04	5.64	24	5
Experience points	546.09	369.37	1,667	96
(Level)	(4)		(7)	(1)

Table 3 presents the levels of academic writing ability, as indicated by the pretest and posttest scores, along with the experience points, which reflect learning engagement. The pretest score had a mean of 7.76 (S.D. = 4.82), with a maximum score of 22 and a minimum of 1. The posttest score showed an improvement, with a mean of 16.04 (S.D. = 5.64), ranging from a maximum score of 24 to a minimum of 5. Learning engagement, represented by experience points, was at Level 4, with an average of 546.09 (S.D. = 369.37). The highest level was 7 (1,667 points), and the lowest level was 1 (96 points).

2. Improvement in Academic Writing Ability

The analysis revealed a significant improvement in academic writing ability after the introduction of gamified lessons. The mean post-test score increased from 7.76 to 16.04 out of 25, indicating that the challenge-based gamification approach was effective in improving students' writing skills ($t = 8.924$, $p < 0.01$).

Table 4 Comparison of Pre-test and Post-test Scores

Scores	Mean	t Stat	P-value
Pre-test	7.76	-8.924	0.000
Post-test	16.04		

3. Relationship Between Writing Ability and Engagement

The academic writing ability is represented by the post-test score while the learning engagement is reflected by the learning experience points. The following table summarizes the data of these two variables.

Table 5 Correlational analysis between Post-test score and experience points

Metric	Value
Pearson Correlation Coefficient (r)	0.208
Significance Level (p-value)	0.166
Correlation Percentage	4.31%

Table 5 presents the relationship between post-test scores and experience points. The Pearson Correlation Coefficient (r) is 0.208, which suggests a weak positive association, indicating that increases in experience points are only slightly related to increases in post-test scores. The p-value of 0.166 is greater than the standard significance level of 0.05, implying that this correlation is not statistically significant, and thus the evidence is insufficient to confirm a meaningful linear relationship between the two variables. The Correlation Percentage, calculated at 4.31%, indicates that only a small fraction of the variability in post-test scores can be attributed to experience points, which further highlights the minimal strength of this relationship.

4. Students' satisfaction on Learning Through Challenge-Based Gamification Lessons

Table 6 summarizes the overall student opinions in seven dimensions.

Table 6 Overall Student Opinions on Challenge-Based Gamification Lessons

Dimension	Mean	S.D.	Level
Achievement	4.00	0.82	High
Challenge	3.93	0.83	High
Competition	3.56	1.02	High
Guidance	4.01	0.77	High
Immersion	3.75	0.88	High
Fun	3.93	0.82	High
Social Experience	3.90	0.83	High
Overall	3.87	0.87	High

The questionnaire results showed high levels of student satisfaction with the gamified lessons. The highest scores were reported for guidance ($\overline{X}$ = 4.01, S.D. = 0.77), achievement ($\overline{X}$ = 4.00, S.D. = 0.82), and fun ($\overline{X}$ = 3.93, S.D. = 0.82). However, competition received moderate scores ($\overline{X}$ = 3.56, S.D. = 1.02), indicating that students were less motivated by competitive elements, preferring the non-competitive aspects of gamification.

Discussion

The findings of this study indicate that challenge-based gamification can significantly enhance academic writing ability and learning engagement among undergraduate students. The analysis showed a substantial improvement in post-test scores compared to pre-test scores, suggesting that incorporating game elements positively impacts writing skills. These findings align with existing research demonstrating gamification's effectiveness in improving educational outcomes, especially in boosting student engagement and performance (Hamari et al., 2014).

1. Academic Writing Ability and Learning Engagement

The first research objective was to examine levels of academic writing ability and learning engagement. Results showed a notable improvement in writing ability, with post-test scores rising from 7.76 to 16.04. This improvement is attributed to the structured nature of challenge-based gamification, which maintained students' focus on aspects like grammar and critical thinking. Weekly challenges helped students build skills gradually, aligning with scaffolding theories (Kapp, 2012). Learning engagement, measured by experience points averaging 546.09, showed consistent involvement. Gamified elements like points, leaderboards, and badges provided immediate feedback, boosting motivation and positively impacting learning outcomes (Çakıroğlu, Basibüyük, Güler, Atabay & Memiş, 2017).

2. Improvement in Academic Writing Ability Before and After the Gamified Lessons

The second objective was to compare academic writing ability before and after implementing challenge-based gamification lessons. The substantial improvement from an average score of 7.76 in the pre-test to 16.04 in the post-test reflects the effectiveness of the gamified approach in enhancing students' writing skills. This statistically significant increase ($t = 8.924$, $p < 0.01$) shows that the integration of challenges, points, and regular feedback played a critical role in maintaining motivation and focusing students' attention on progressively complex writing tasks. This is consistent with the findings of previous studies that have highlighted gamification's ability to transform challenging academic tasks into engaging activities that support incremental improvement (Hamari et al., 2014).

3. Relationship Between Academic Writing Ability and Learning Engagement

The third objective was to investigate the relationship between academic writing ability and learning engagement. The correlation analysis showed a Pearson coefficient ($r = 0.208$), indicating a weak positive relationship between the two variables. The significance level ($p = 0.166$) suggests this correlation was not statistically significant, meaning higher engagement, as measured by experience points, had only a minimal impact on improved writing scores. The determination

coefficient (4.31%) also shows that engagement accounted for only a small portion of the variance in writing performance.

The weak correlation may be due to several factors. Although gamification engaged students, writing development relies heavily on individual skills and intrinsic motivation, which experience points cannot fully capture. Factors like initial writing ability, prior knowledge, and perceptions of gamified activities also likely influenced outcomes (Fredricks et al., 2004). Studies have indicated that while gamified environments generally boost engagement, their effects on skill improvement vary depending on subject complexity and individual needs (Hanus & Fox, 2015).

4. Student Satisfaction with Challenge-Based Gamification

The fourth objective was to examine student satisfaction with the challenge-based gamification approach. Questionnaire data showed high overall satisfaction, especially for guidance (mean = 4.01) and achievement (mean = 4.00). Students appreciated structured challenges, immediate feedback, and tracking progress in real-time, which helped maintain motivation. However, competition received slightly lower ratings (mean = 3.56), indicating mixed responses to leaderboards. This aligns with literature suggesting that while leaderboards motivate some, they can discourage others who struggle to keep up (Barata, Gama, Jorge & Gonçalves, 2013). Balancing competitive and collaborative elements could help ensure benefits for all students.

Practical Implications

The findings from this study have several practical implications. First, educators looking to improve students' academic writing ability may consider incorporating challenge-based gamification to make the learning experience more engaging and interactive. Gamification has proven effective in sustaining motivation and breaking down complex tasks, which is particularly beneficial for writing instruction, often perceived as difficult or tedious by students. Furthermore, since the correlation between engagement and performance was found to be weak, it is crucial to incorporate other supportive elements, such as personalized feedback and opportunities for peer collaboration, to enhance the effectiveness of gamification.

This approach could lead to a more balanced and comprehensive learning environment that fosters both engagement and skill development (Seixas, Gomes & Filho, 2016).

Recommendations

1. Recommendations for Applying Research Findings

To effectively apply the findings of this study, educators should be mindful of the balance between competitive and cooperative activities in challenge-based gamification. While competitive elements were well-received by many students, they were demotivating for others. Therefore, creating an inclusive learning environment that balances both types of activities is crucial to ensuring all students remain engaged. Additionally, relying solely on metrics such as experience points may not fully capture students' cognitive engagement. Implementing a combination of quantitative measures (e.g., experience points) and qualitative insights (e.g., feedback or self-reflection) can offer a more comprehensive understanding of students' engagement and learning progression.

2. Recommendations for Future Research

Future research should address the limitations of this study by including a control group to enable causal inferences about the effectiveness of challenge-based gamification on writing skills. The weak correlation between engagement and writing performance suggests that additional metrics, such as qualitative interviews, may better capture cognitive engagement. Expanding the sample size and including participants from multiple universities would also enhance the generalizability of the findings. Finally, future studies should assess the long-term impacts of gamification, specifically looking at how balancing competitive and cooperative activities influences engagement and performance over time.

Conclusion

Challenge-based gamification is an effective method for improving academic writing ability and increasing student engagement. This study provides evidence that integrating gamified elements into writing instruction can foster a more engaging and satisfying learning experience for students.

Acknowledgement

This research on "Enhancing Students' Learning Engagement and Academic Writing Ability through Challenge-Based Gamification Lessons" was funded by the Faculty of Humanities and Social Sciences at Nakhon Ratchasima Rajabhat University, Fiscal Year 2022. The research team extends their sincere gratitude for this support.

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