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A Comparative Analysis of Gamification and Project-Based Learning Approaches in Teaching Research Writing to Enhance Engagement, Critical Thinking, And Academic Performance

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Abstract: This study examines the differences between Gamification and project-based Learning (PBL) in teaching research writing to university students. Thirty participants were split into two groups using a qualitative research design: one group received instruction via Gamification, which included challenges and prizes, while the other group received PBL, which involved students working on real-world research projects. Results show that Gamification made studying more interesting and fun while significantly increasing student enthusiasm and involvement. Even though Gamification was ideal for short-term engagement, the approach did not improve research writing proficiency. In contrast, PBL was more beneficial in improving critical thinking, analytical skills and research writing skills. Students in the PBL group demonstrated stronger writing abilities and analytical skills. This study emphasizes the necessity of including PBL in research writing courses and proposes a hybrid strategy combining the two approaches to offer the best possible learning environment.

Keywords: Gamification, Project-Based Learning, Research Writing, Student Engagement, Educational Strategies, Higher Education, Qualitative Study, Learning Outcomes.

Introduction: Context and Background

Teaching research writing is a challenging process requiring students to develop their critical thinking, analytical skills, and thorough understanding of methodological ideas. Innovative teaching methods such as Gamification and project-based Learning (PBL) have gained attention for their potential to enhance student engagement and learning outcomes. Gamification integrates game-like elements, such as points, badges, and leaderboards, to create an interactive learning environment (Boom-Cárcamo, Buelvas-Gutiérrez, Acosta-Onñate, & Boom-Cárcamo, 2024). Conversely, PBL engages students in practical projects that foster teamwork, critical thinking, and problem-solving skills (Tangney, Sullivan, & Lawlor, 2024; Alsmadi, Kandasamy, Al Kafri, & Zahirah, 2024). Since these methods provide different instructional approaches with differing effects on students' research writing abilities, it is essential to compare them.

Gamification and project-based Learning (PBL) have emerged as two influential pedagogical approaches to enhance student engagement, motivation, and learning outcomes. Using game features in non-gaming environments, or Gamification, has become popular in educational settings because it can increase motivation and enhance learning outcomes (Hong et al., 2024). Games offer unique benefits for teaching project management by providing:

- Risk-free environments for experimentation
- Immediate feedback
- Engaging and motivating experiences
- Opportunities to learn from mistakes (Wang et al., 2024)

Project-based learning has evolved from a learning method to a philosophy and didactic conception that integrates knowledge construction and research approaches (Lasauskiene & Rauduvaite, 2015). Implementing PBL can improve teaching quality and student engagement by involving students in complex problem-solving and innovative solutions. PBL is important to develop students' creative cognition by encouraging active exploration, collaborative problem-solving, and practical application of knowledge (Yu, 2024). PBL fosters students' authentic research and problem-solving skills and contributes to higher-level cognitive development (Lasauskiene & Rauduvaite, 2015). Moreover, PBL assists students in developing

important professional skills like teamwork, critical thinking, communication, and problem-solving through engagement with real-world projects (Fernandes, 2014).

Application of both methods in online classes.

The effectiveness of online teaching depends heavily on teachers' pedagogical competence and psychological readiness. Training programs should focus on developing technical skills and psychological competencies like creativity, curiosity, love of learning, judgment, and perspective (Ho et al., 2023). As for the digital century, online classes are standard for some students studying online for different reasons. Teachers working in online groups significantly improved academic knowledge (theoretical understanding) and professional knowledge (applied skills). They applied knowledge (contextual application), and virtual project-based tasks promoted Meaningful Learning through collaboration (García, 2016). Students report higher confidence and motivation when working on real-world computing projects than traditional learning approaches (Alsmadi et al., 2024).

PBL is effective in online and face-to-face settings for enhancing students' transversal skills like collaboration, communication, and critical thinking (Tangney et al., 2024). Similarly, computer-based games can effectively bridge the gap between classroom learning and real-world application while developing technical knowledge and soft skills (Grijalvo et al., 2022). Game-based learning denotes the attainment of specified educational objectives via digital and non-digital games, content, and play (Abou Hashish, Ebtsam Aly, et al., 2024). There must be a careful balance between learning and enjoyment in educational games. The "Software Project Management Game" demonstrated success in this by incorporating motivational game design principles while still achieving learning objectives (Wang et al., 2024). Visualizations in e-learning materials can help students better understand complex technical concepts compared to traditional ways of teaching (Müller et al., 2015).

PBL and GBL are in higher education

Using game-based Learning (GBL) in higher education has several benefits: increased student engagement and motivation, improved problem-solving abilities, better knowledge acquisition and understanding, and development of interpersonal and communication skills (Almeida, Buzady & Ferro, 2021). Game elements in educational Gamification can be grouped into five main clusters (Hong et al., 2024):

- Performance elements (e.g., rewards, progress tracking)

- Personal elements (e.g., challenges, customization)
- Social elements (e.g., competition, cooperation)
- Ecological elements (e.g., time pressure, access control)
- Fictional elements (e.g., narrative, storytelling)

Current teacher preparation programs lack adequate exposure to game-based instruction methods (Hu & Sperling, 2022). Time limitations in current educational contexts make it challenging for students to develop needed game expertise (Boysen et al., 2023). However, in PBL, the teacher's role shifts from transmitter of information to facilitator of learning, requiring different evaluation approaches than traditional teaching methods (Pan et al., 2021).

Amamou and Cheniti-Belcadhi (2018) outline distinct tutor roles in PBL:

- Academic tutors who facilitate learning and define projects
- Professional tutors who bring real-world project ideas
- Peer tutors who provide different types of support:
 - Realization tutors who help with specific tasks
 - Check tutors who verify work
 - Help tutors who provide technical assistance

Studies show that PBL significantly positively affects problem-solving abilities, conceptual understanding, and student performance compared to conventional teaching approaches (Pan et al., 2021). Tsybulsky and Muchnik-Rozanov (2023) point out that this comprehensive approach, PBL, has been proven particularly valuable in STEM education and teacher preparation programs, providing theoretical knowledge and practical experience in modern educational methods. PBL involves students applying previously acquired knowledge to produce tangible outputs, typically through written or oral reports summarizing their work and outcomes (Bulut Ates & Aktamis, 2024). Integrating interdisciplinary Learning and real-world problems is key to effective PBL implementation (Bulut Ates & Aktamis, 2024).

Research Problem

Farrow et al. (2024) found that teachers often incorporate PBL elements in their design but struggle with high-quality implementation of practices, particularly around providing student support and authentic connections. Despite their growing popularity, comprehensive studies comparing

Gamification and PBL in teaching research writing are limited. Both methods have shown promise in different educational contexts, but their specific effectiveness in research writing, which demands unique skill sets, is underexplored. In order to close this gap, this study compares the unique contributions of PBL and Gamification to the teaching of research writing. Its goal is to determine whether the method produces better student involvement, understanding, and skill development results.

Objectives and Research Questions

This study compares the effectiveness of Gamification and project-based learning learning in teaching research writing. The objectives are:

1. To assess the impact of Gamification on student engagement and learning outcomes in research writing.
2. To evaluate the effectiveness of PBL in enhancing students' research writing skills.
3. To identify the strengths and weaknesses of each approach in teaching research writing.
4. To provide recommendations for educators on effective teaching methods for research writing.

The research questions guiding this study are:

1. How does Gamification influence student engagement and learning outcomes in research writing?
2. What is the impact of PBL on students' research writing skills?
3. What are the comparative strengths and weaknesses of Gamification and PBL in teaching research writing?
4. Which approach is more effective in improving students' research writing abilities?

Hypothesis

The study's hypothesis states that both Gamification and PBL have noticeable impacts on teaching research writing. Gamification will likely boost motivation and engagement while PBL may encourage deeper comprehension and long-term skill improvement.

- H1: Gamification significantly increases student engagement in research writing compared to traditional methods.
- H2: PBL leads to a more substantial improvement in students' research writing skills than Gamification.

METHODS

Study Design

Traditional lecture-based teaching methods are being replaced by more innovative, active approaches due to low student motivation and the evolving landscape of

learning methods (Gómez-Urquiza et al., 2022; Navarro-Mateos & Pérez-López, 2022). When case-based learning and escape room activities are combined, an engaging and dynamic learning environment that fosters critical thinking, collaboration, and the real-world application of theoretical information is created (Vázquez-Calatayud et al., 2024).

This study employs a qualitative research design to explore the differences between Gamification and project-based Learning (PBL) approaches in teaching research writing. Bakhru and Mehta (2020) propose moving away from traditional internal tests toward more continuous, assignment-based assessment methods that:

- Encourage regular class attendance
- Provide rapid feedback
- Promote deeper learning
- Reduce faculty workload
- Support outcome-based education goals

Participants

The study involved 30 students from the "Research Writing" club in the Foreign Languages Department at Urgench State University after Abu Rayhan Beruni. The participants were divided into two groups: 15 students (7 boys and eight girls) were taught using the gamification method, while the other 15 were taught using the PBL approach.

Intervention

Gamification: The gamification group was exposed to research writing concepts through game-based activities. These included using points, badges, and leaderboards to motivate and engage students. The tasks included game challenges to encourage students to compete and work together.

The group participating in Project-Based Learning (PBL) worked on practical research writing assignments. The task was to design a thorough research project that included choosing a topic, reviewing relevant literature, gathering data, analyzing it, and writing a report. This method prioritized collaborative learning, critical thinking, and problem-solving.

Data Collection

Guo et al. (2020) identified several practical assessment approaches: questionnaires, rubrics, tests, interviews, self-reflection journals, and artifact analysis.

Data were collected using a combination of surveys, assessments, and semi-structured interviews.

- Surveys were administered to gather initial insights into students' perceptions of the teaching methods.

- Assessments included pre-tests and post-tests to evaluate the improvement in students' research writing skills.

- Semi-structured interviews were conducted with selected participants better to understand their experiences and attitudes toward the teaching methods.

Data Analysis

The collected data was analyzed to generalize the benefits and drawbacks of the two approaches. The effectiveness of each teaching technique was assessed by comparing the pre-test and post-test outcomes. Significant insights into the students' study experiences were also gained through the analysis and classification of qualitative interview data.

RESULTS

Key Findings

The analysis showed that project-based learning (PBL) was more effective than Gamification in teaching research writing. Students in the PBL group showed better comprehension and application of research writing skills, as evidenced by their higher post-test scores and more positive feedback during interviews. Conversely, while Gamification increased immediate engagement, its impact on deep learning and skill development was less pronounced than that of PBL.

Tables and Figures

To support these findings, we will include tables and charts:

1. Table 1: Comparison of Pre-test and Post-test Scores for Gamification and PBL Groups.
2. Figure 1: Bar Graph of Average Improvement in Research Writing Scores.
3. Figure 2: Pie Chart of Student Feedback on Teaching Methods.
4. Table 2: Themes Identified from Qualitative Data.

Subsection by Research Question

Research Question 1: How does Gamification affect research writing learning outcomes and student engagement?

- **Results:** Gamification considerably raised class participation. It did not affect the retention of research writing abilities.

Research Question 2: What can be a source of improving research writing skills?

- Results: Higher post-test scores and project submissions demonstrated that PBL significantly enhanced research writing abilities.

Research Question 3: What are the relative advantages and disadvantages of PBL and Gamification in research writing

- instruction?
- Results: While PBL was more successful in encouraging critical thinking and the real-world application of research writing abilities. Gamification was superior at sustaining student interest and

involvement.

Research Question 4 Which method works best for enhancing students' capacity for research writing ?

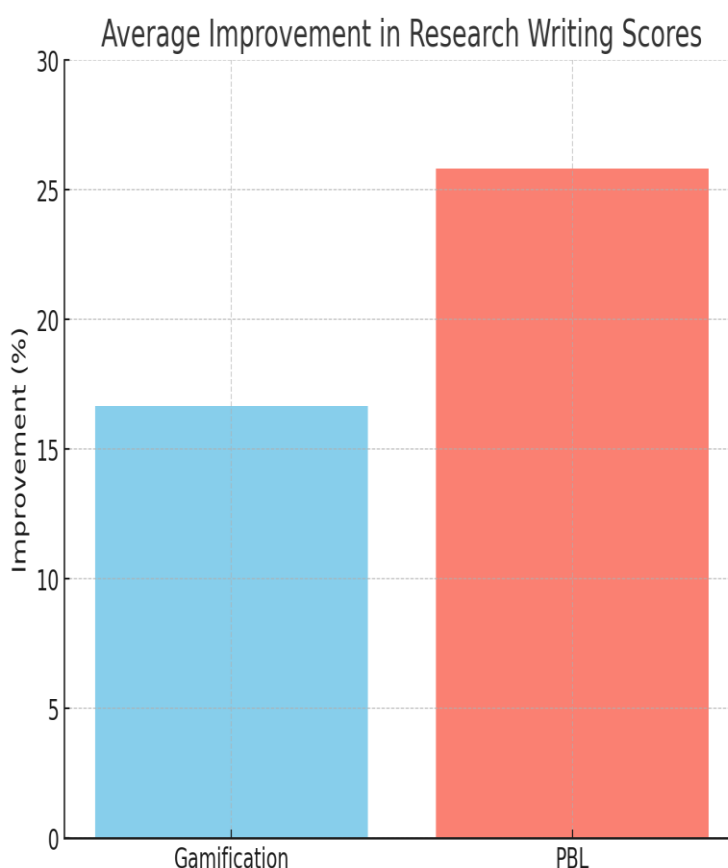
- Results: PBL worked marginally better than Gamification in improving research writing skills while giving students a more thorough educational experience.

Tables and figures will be provided to support these conclusions:

1. Table 1: Gamification and PBL Groups' Pre-test and Post-test Score Comparison.

Group	Pre-test Average Score	Post-test Average Score	Improvement (%)
Gamification	60	70	16.67
PBL	62	78	25.81

2. Figure 1: Bar Graph of Average Improvement in Research Writing Scores.



3. Figure 2: Pie Chart of Student Feedback on Teaching Methods.

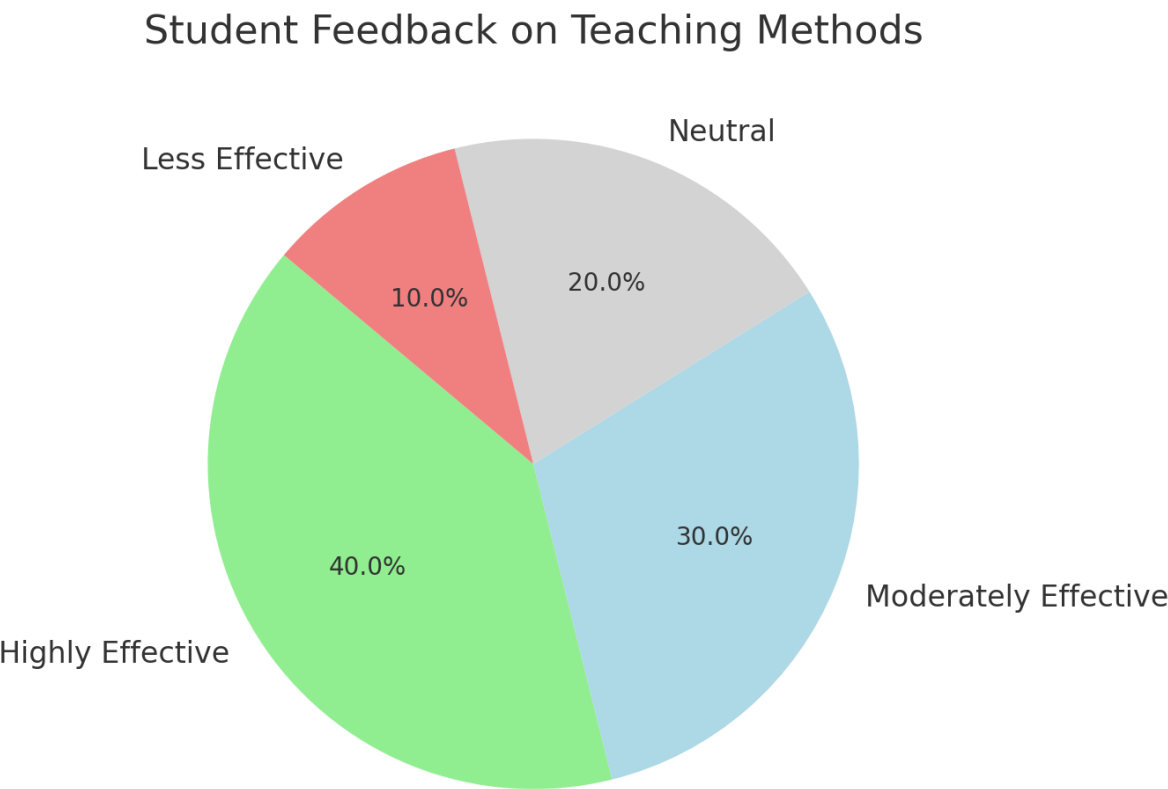


Table 2: Themes Identified from Qualitative Data

Theme	Description	Frequency
Increased engagement	Students reported higher engagement levels during gamification sessions.	12
Deeper understanding	PBL was associated with a better comprehension of the principles of research writing.	15
Collaboration and teamwork	PBL fostered better collaboration among students.	10
Motivation challenges	Gamification had mixed effects on long-term motivation.	8

DISCUSSION

Interpretation of Results

According to the results, students' research writing abilities were enhanced more by project-based Learning (PBL) than by Gamification. Participating in real-world projects fosters a more profound comprehension and practical application of research writing topics, as seen by the PBL group's improved post-test results. In contrast, while Gamification notably increased student engagement, its impact on long-term skill enhancement was less substantial. Research writing requires critical thinking and synthesis, which may not always align with gamification mechanics (Bacsá-Károlyi & Feh'ervari, 2024).

These findings align with the study questions, demonstrating that PBL outperforms Gamification in fostering the growth of thorough research writing abilities. This suggests that PBL provides a more solid foundation for in-depth learning and real-world skill application, even though Gamification is useful for encouraging early engagement and motivation. However, combining project-based learning with game-based elements could provide a practical approach to teaching project management skills while maintaining student engagement and providing opportunities for practical experience.

Comparison with Existing Literature

The results coincide with previous studies highlighting how PBL improves critical thinking and problem-solving abilities (Tangney et al., 2024; Alsmadi et al., 2024). Previous research has shown that PBL improves learning outcomes by assisting students in connecting theoretical knowledge to real-world applications. In contrast, research on Gamification (Boom-Cárcamo et al., 2024) often highlights its effectiveness in boosting motivation and engagement rather than facilitating profound learning outcomes. Moreover, Gamification is of great importance in non-game contexts, whereas Project-Based Learning (PBL) fosters more profound understanding and skill development through real-world applications.

Project-based Learning (PBL) in higher education helps develop critical thinking, interpersonal communication, media literacy, collaboration, teamwork, and leadership skills essential for 21st-century competencies (Chu, Reynolds, Tavares, Notari, & Lee, 2017). Project-Based Learning (PBL) is a practical pedagogical approach for teaching complex skills and concepts, as it promotes student engagement, deeper learning, and the development of practical competencies through active exploration of real-world

problems (Ashraf et al., 2025). Project-based learning helps bridge the gap between academia and industry by allowing students to apply theoretical knowledge to practical situations while developing essential soft skills (Díaz Mohedo & Vicente Bújez, 2014). Nevertheless, teachers may struggle implementing high-quality PBL due to lacking resources and extensive professional learning requirements (Potvin et al., 2021).

Teachers' attitudes and beliefs about Gamification are crucial to its implementation. Some teachers see it as an effective way to improve student's focus, while others worry about its applicability to complex academic tasks, namely, research writing (Pupik Dean et al., 2023). PBL supports in-depth skill development in research writing, whereas Gamification may be more effective for reinforcing specific writing mechanics (e.g., citations, grammar).

Jaaska and Aaltonen (2022) denote that game-based learning should supplement existing approaches rather than take their place. GBL can give students a risk-free, simulative environment to practice management skills, which might help them learn the subject more quickly and supplement traditional approaches in project management education. Many curriculum guides are created to support teachers' adoption of digital games for learning, but their effectiveness has not been studied (Sharma et al., 2025). Curriculum guides can effectively support teachers' adoption of digital games for learning, but their impact on teachers' acceptance needs to be studied systematically (Sharma et al., 2025).

To be effective, the Gamification of learning experiences must be carefully structured with precise mechanics, dynamics, and emotions (MDE framework) (Grijalvo et al., 2022).

Implications

These results impact teaching practices and curriculum design. Educators should consider incorporating PBL more extensively in courses that require in-depth analytical and writing skills, such as research writing. Gamification can still be helpful in the early stages of learning to increase engagement, but it should be paired with other strategies to promote deeper learning. Future research should investigate how these methods can be combined to take advantage of both approaches.

Despite extensive training and education in project management, projects frequently fail due to insufficient practical experience and skills (Wang et al., 2024). There is a growing need for lessons that allow learners to experiment and learn from mistakes without expenses.

Limitations

This study has several limitations. The sample size of participants was only 30 students from a single university, which may limit the findings. Furthermore, the study concentrated only on the short-term effects of the teaching methods without examining long-term retention and application of the learned skills.

Recommendations

Furthermore, integrating strategies that include PBL and Gamification elements may improve engagement and learning results. Creating curricula that use PBL to establish fundamental skills and incorporating gaming into education to increase student motivation and engagement throughout the early stages of learning are two examples of integrating education into real life. Analyzing how teachers and students feel about each approach may help identify the most effective ways to instruct research writing.

CONCLUSION

Summary of Main Points

This research examined the effectiveness of PBL and GBL in teaching research writing. The findings indicate that PBL had a more significant impact on students' research writing skills than Gamification. PBL encouraged more in-depth understanding and real-world application, whereas Gamification considerably raised student interest but had less effect on long-term skill development. The findings show that PBL is more effective in increasing writing skills than the Gamification approach. These results suggest that PBL provides a deeper structure of enhancing research writing abilities, even though Gamification helps boost early interest and participation.

Final Thoughts

The results indicate that setting goals in research writing classes to improve writing skills is difficult. While Gamification can effectively engage students, integrating PBL into the curriculum could lead to better long-term outcomes in research writing skills. Teachers should integrate both approaches in their instruction to maximize learner engagement and showcase the benefits of both approaches. Future research could further explore these combinations to develop more comprehensive teaching strategies for enhancing student engagement and skill improvement.

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