Differentiated Instruction and Gamification Strategies: An Investigation into the Student's Academic Competence and Performance in Mathematics

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ABSTRACT

Innovative teaching strategies, such as differentiated instruction and gamification, have gained increasing recognition for their potential to enhance student engagement and improve learning outcomes in mathematics. This study investigated the relationship between teachers' levels of implementation of these strategies and the academic competence and performance of Grade 9 students at Concepcion National High School. A descriptive-correlational research design was utilized. Data were collected from 120 randomly selected students using validated and pilot-tested instruments, including questionnaires, performance assessments, and academic records, to ensure the reliability and accuracy of the data. To assess the strength of the relationships among variables, Pearson's r correlation was employed. The study examined the extent to which teachers practiced gamification and differentiated instruction by calculating mean and standard deviation scores. Results revealed that both strategies were consistently and highly implemented. Students' academic competence and performance were also evaluated using descriptive statistics, showing that both strategies contributed to improved outcomes. Findings showed strong positive correlations between differentiated instruction and both academic competence (r = .701) and performance (r = .702). Similarly, gamification was positively correlated with academic competence (r = .639) and performance (r = .544). These results suggest that teachers who frequently utilized these strategies had students with higher academic achievement and demonstrated competence in mathematics. The study concludes that the effective implementation of differentiated instruction and gamification is strongly associated with enhanced student academic outcomes. Limitations of the study include the relatively small sample size, possible teacher familiarity bias, and limited generalizability. Future research is encouraged to explore longitudinal effects and broader demographic contexts..

Keywords: Gamification, Differentiated Instruction, Academic Competence, Academic Performance in Mathematics

INTRODUCTION

In contemporary education, there is a growing emphasis on developing students who are critical thinkers, collaborative problem-solvers, and adaptive learners. As a result, educators have increasingly adopted more dynamic, interactive, and student-centered teaching methodologies, such as differentiated instruction and gamification, to cater to diverse learning needs and promote deeper engagement.

One such strategy is the use of performance tasks—authentic assessments that require students to apply knowledge, demonstrate skills, and solve real-world problems. These tasks foster not only academic competence but also independent learning, creativity, and collaboration (Kelly, 2019; Wiggins & McTighe, 2005). Research has shown that performance-based assessments can improve students' problem-solving abilities and enhance critical thinking (Brophy, 2008; Resnick, 1987; Darling-Hammond, 2010).

In addition to benefiting students, performance tasks contribute to the professional growth of educators by expanding their use of innovative strategies, technology, and assessment tools (Ulucinar & Dinc, 2021; Hattie, 2009; Bandura, 1997). Unlike traditional assessments that often focus on rote memorization, performance tasks encourage deeper learning through relevant, real-life applications (Gulikers, Bastiaens, & Kirschner, 2004;

Mertler,2009; Gibbons, 2011). These shifts align with the demands of 21st-century learning and workforce preparedness (P21Framework for 21st Century Learning, 2007).

As educational institutions evolve, they are increasingly expected to provide inclusive and personalized learning environments. Differentiated instruction and gamification have emerged as prominent pedagogical approaches that support this goal (Katrina, 2024). Differentiated instruction allows teachers to tailor lessons according to students' readiness, interests, and learning profiles. In contrast, gamification applies game-like elements—such as point systems, badges, or leader boards—to non-game contexts, making learning more engaging and interactive.

Although both strategies have demonstrated effectiveness in previous studies, much of the research has focused on general implementation rather than exploring how the level of practice by teachers directly affects student outcomes. Furthermore, the literature often overlooks key variables such as the reliability and consistency of strategy application and the possible influence of teacher bias, prior student achievement, or familiarity with the approach.

For example, differentiated instruction has been shown to improve mathematical problem-solving and reduce achievement gaps among learners of differing abilities (Sezgin et al., 2018). However, few empirical studies have measured the correlation between teachers' fidelity of implementation and actual student performance metrics. Likewise, while gamification is increasingly used in mathematics classrooms, its direct impact on academic competence remains underexplored, particularly in low- to mid-income public school contexts.

To address these gaps, the current study aims to examine how teachers' levels of implementing differentiated instruction and gamification strategies relate to students' academic competence and performance. The research also considers the reliability and validity of the data collection instruments used and identifies limitations that may affect generalizability.

By understanding these relationships, this study intends to provide actionable insights that can enhance instructional planning and contribute to more equitable and effective teaching practices in mathematics education.

Statement of the Problem

This study aims to evaluate the relationship between the teacher's level of practice of differentiated instruction and gamification on the student's academic competence and performance in mathematics for Grade 9 students at Concepcion National High School for the School Year 2024-2025.

Specifically, it sought to answer the following research questions:

1. What is the teachers' level of practice?
    a. Differentiated Instruction;
    b. Gamification?
2. What is the level of the student's academic competence?
3. What is the level of the student's performance?
4. Is there a significant relationship between the teachers' level of practice of differentiated instruction and student's academic competence?
5. Is there a significant relationship between the teachers' level of practice of differentiated instruction and student's performance?
6. Is there a significant relationship between the teachers' level of practice of gamification and student's

academic competence?

7. Is there a significant relationship between the teachers' level of practice of gamification and student's academic performance?

METHODOLOGY

Research Design

This study employed a quantitative descriptive-correlational research design to investigate the relationship between teacher's levels of practice in differentiated instruction and gamification, and the academic competence and performance of Grade 9 students in mathematics. The correlational approach was chosen to identify the strength and direction of the association between these teaching strategies and student outcomes without manipulating any variables. Student performance was measured through quarterly exam scores and final grades, while the implementation levels of teaching strategies were assessed using structured survey instruments. Data gathered through validated and reliable tools allowed the researchers to establish patterns and interpret the relationship between the identified variables. This design enabled the identification of trends and relationships that could inform future instructional practices (Eliopoulos, 2004).

Respondents of the Study

The study was conducted at Concepcion National High School during the School Year 2024–2025 and involved Grade 9 Junior High School students. A total of 120 students were selected using simple random sampling from a population of 170, ensuring that the sample was unbiased and representative of the larger population. These students were distributed across four heterogeneous sections, with each section composed of 30 students. Two sections were taught using differentiated instruction strategies and the other two with gamification strategies. While the student grouping was randomized, teacher assignments were not matched across sections, which is acknowledged as a limitation in the study's design.

Research Instruments

To assess the teacher's levels of implementation, two survey instruments were developed—one for differentiated instruction and another for gamification. Each instrument used a 5-point Likert scale ranging from "Rarely Practiced" to "Always Practiced." The differentiated instruction survey included items focusing on classroom practices such as content modification, flexible grouping, formative assessments, and instructional adjustments based on student needs. The gamification survey assessed how frequently teachers incorporated game-based elements like points, levels, badges, leaderboards, and interactive learning tasks into their lessons. Both instruments underwent expert validation and were pilot-tested to ensure relevance and clarity. Internal consistency was measured using Cronbach's alpha, with reliability coefficients of 0.88 for the differentiated instruction scale and 0.84 for the gamification scale, indicating strong reliability.

Academic competence was evaluated using a structured, standardized examination aligned with the Department of Education's Grade 9 mathematics curriculum. This assessment included multiple-choice questions, problem-solving tasks, and real-world applications of mathematical concepts, with a total score of 50 points. The exam was developed with input from mathematics educators to ensure content validity, and a pilot test was administered to assess difficulty and clarity. A scoring rubric adapted from iParadigms (2012) was used to ensure consistency and inter-rater reliability during the grading process.

Students' academic performance was measured using an adapted grading system of department of education that reflected the level of mastery of subject competencies. The grades were based on actual report card results and categorized into five levels: Outstanding (90–100%), Very Satisfactory (85–89%), Satisfactory (80–84%), Fairly Satisfactory (75–79%), and Did Not Meet Expectations (below 75%). This approach provided a standardized, school-recognized measure of overall academic achievement.

Data Collection and Analysis

Data collection was conducted during the second quarter to ensure sufficient exposure to the teaching strategies.

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The collected data were coded, processed, and analyzed using descriptive statistics, specifically mean and standard deviation, to describe the levels of practice and student's academic competence and performance in mathematics. To examine the relationships between variables, Pearson's r correlation was employed, allowing the researchers to quantify the degree of association between the teaching strategies and student outcomes. The analysis and interpretation of data were intentionally separated in the presentation of results.

RESULTS AND DISCUSSION

This chapter presents the results, discussions, and analysis of the data gathered that sought to answer the study's objectives.

Table 1 Teacher's Level of Practice of Differentiated Instruction

Indicators	**Mean**	**SD**	**Interpretation**
1. My teacher adjusts the lesson content to match my ability level or prior knowledge	4.30	0.59	Highly Practiced
2. My teacher provides different ways for us to learn and practice the material (e.g., different activities or resources).	4.23	0.65	Highly Practiced
3. I feel that the assignments and activities are tailored to my personal interests or learning preferences.	4.17	0.62	Often Practiced
4. My teacher gives us choices on how we can demonstrate our understanding (e.g., projects, presentations, tests).	4.27	0.63	Highly Practiced
5. My teacher often groups us in different ways based on our needs, strengths, or learning styles.	4.15	0.61	Often Practiced
6. My teacher incorporates technology to support various learning styles.	4.2	0.74	Highly Practiced
7. My teacher makes learning relevant by connecting lessons to real-life situations.	4.28	0.61	Highly Practiced
8. My teacher gives us the opportunity to showcase our talents while we are learning.	4.25	0.75	Highly Practiced
9. My teacher accepts our diversity in learning process.	4.33	0.71	Highly Practiced
10. My teacher uses a variety of assessments to measure my learning progress.	4.24	0.22	Highly Practiced
Overall	**4.24**	**0.22**	Highly Practiced

Table 1 indicates the teachers' level of practice of Differentiated instruction (DI) has overall mean score is 4.24 with a standard deviation of 0.22, suggesting a high level of practice with low variability in responses. The results indicate that teachers are consistently applying differentiated instruction practices, with most indicators showing a high level of implementation. Although there are small variations, overall, the teaching methods are tailored to accommodate students' diverse needs, preferences, and learning styles, ensuring an inclusive and effective learning environment.

Recent studies emphasize the importance of differentiated instruction in promoting student engagement and achievement. According to Tomlinson (2017), differentiated instruction is key in fostering a positive learning environment that meets diverse student needs. Similarly, Hattie (2017) found that students in classrooms where differentiated practices are employed tend to show improved learning outcomes. Additionally, research by Santangelo and Tomlinson (2019) supports the idea that teachers who effectively implement differentiated

strategies are able to address the varying levels of student readiness, interests, and learning profiles, leading to higher engagement and academic success.

Table 1 Teacher's Level of Practice of Gamification

Indicators	Mean	SD	Interpretation
1. My teacher uses game-like elements (e.g., points, levels, rewards) to make lessons more fun and engaging.	4.1	0.77	Often Practiced
2. I regularly use digital tools or games that help me understand the lesson better.	4.27	0.71	Highly Practiced
3. There are competitions or challenges in class that motivate me to do my best.	4.22	0.69	Highly Practiced
4.I enjoy the classroom activities that are designed like games (e.g., quests, missions, or challenges).	4.3	0.72	Highly Practiced
5.My teacher provides feedback on my progress through game-like features, such as badges, points, or rankings.	4.27	0.76	Highly Practiced
6. My teacher uses leader boards or point systems to encourage participation.	4.25	0.73	Highly Practiced
7. My teacher designs lessons that include teamwork or cooperative challenges.	4.05	0.75	Often Practiced
8. I feel a sense of achievement when I complete game-like challenges in class.	4.28	0.76	Highly Practiced
9. I find mathematics class easier when gamification strategy was incorporated.	4.1	0.8	Often Practiced
10. My teacher uses interactive simulations or educational games as part of the assessment.	4.12	0.72	Often Practiced
Overall	**4.20**	**0.24**	Highly Practiced

Table 2 shows overall mean score is 4.2 (SD = 0.24), indicating a generally high level of practice with minimal variation in responses. The teacher's level of practice of gamification shows high consistency across most indicators. The results suggest that gamification practices are being effectively implemented by the teacher. While most aspects of gamification are strongly practiced, there are slight variations in the extent to which students experience individualized grouping and activities tailored to their needs.

Numerous studies have highlighted the positive impact of gamification in education. According to Anderson and Cheng (2018), gamification increases student motivation and engagement, contributing to better academic performance. A study by Surendeleg et al. (2019) supports this by demonstrating how gamification fosters critical thinking and creativity in students. Furthermore, Lee and Hammer (2017) found that gamified classrooms encourage collaboration and make learning more enjoyable, thus improving student retention and learning outcomes. Additionally, Deterding et al. (2018) emphasize that gamification, when integrated well, enhances the learning experience by making education more interactive and relevant.

Table 3 Level of Student's Academic Competence

Group	**Mean**	**Frequency**	**Percentage**
Gamification	28.52	10.55	Satisfactory

Differentiated Instruction	38.67	9.06	Very Satisfactory
Total	**33.59**	**11.03**	Very Satisfactory

Table 3 presents the level of student's academic competence. The overall mean score is 33.59 (SD = 11.03), falling under the "Very Satisfactory" category. The "Differentiated Instruction" group has the mean score of 38.67 (SD = 9.06), categorized as "Very Satisfactory." The "Gamification" group has a mean score of 28.52 (SD = 10.55), categorized as "Satisfactory."

Numerous studies support the benefits of differentiated instruction in improving student academic performance. Vargas (2017) emphasizes that differentiated instruction addresses the diverse needs of learners, which can lead to higher achievement levels. Similarly, a study by Cruz et al. (2016) highlights that tailoring instruction to student needs fosters engagement and competence. On the other hand, research on gamification, such as the work of Rivera et al. (2018), shows that while gamification can enhance motivation, it may not always result in immediate improvements in academic performance. Garcia et al. (2019) further suggest that the effectiveness of gamification depends on its implementation and the context in which it is applied.

Table 4 Level of Student's Academic Performance

Group	**Mean**	**Frequency**	**Percentage**
Gamification	82.18	10.55	Satisfactory
Differentiated Instruction	87.12	3.72	Very Satisfactory
Total	**84.65**	**4.87**	Very Satisfactory

Table 4 presents the level of students' academic performance. The overall mean score is 84.65 (SD = 4.87), also falling under the "Very Satisfactory" category. The "Differentiated Instruction" group has the highest mean score of 87.12 (SD = 3.72), categorized as "Very Satisfactory." The "Gamification" group has the lowest mean score of 82.18 (SD = 10.55), categorized as "Satisfactory."

Research has shown that differentiated instruction significantly enhances student performance. Hattie (2017) highlights that adapting teaching strategies to meet the diverse learning needs of students leads to better academic outcomes. On the other hand, studies on gamification, such as those by Surendeleg et al. (2017), suggest that while gamification increases student engagement and motivation, its direct impact on academic performance is not always consistent. Similarly, Anderson and colleagues (2019) argue that the effectiveness of gamification is highly dependent on the context and the way in which the gamified elements are implemented.

Table 5 Test of Relationship Between the Teachers' Level of Practice of Differentiated Instruction and Students' Academic Competence

Variable	**R**	**p- value**	**Interpretation**
Level of Practice Academic Competence	.701*	0.000	Strong Positive

*Correlation is significant at the 0.10 level (2-tailed)

Table 5 presents data relationship between the teachers' level of practice of differentiated instruction and students' academic competence. The table shows a strong positive correlation (r = .701) between the teacher's level of practice of differentiated instruction and students' academic competence, with a p-value of 0.0001. This indicates that as teachers' practice of differentiated instruction increases, students' academic competence tends to improve significantly.

There is a strong positive relationship between how well teachers practice differentiated instruction and the academic competence of their students. This suggests that effective differentiated instruction is strongly associated with better academic performance and competence among students.

Research has consistently shown that differentiated instruction positively impacts student outcomes. Studies such as those by Hattie (2017) emphasize the importance of tailoring teaching methods to meet the diverse needs of students, leading to enhanced learning outcomes. Similarly, Tomlinson (2017) affirms that differentiated instruction improves both academic competence and engagement by addressing individual learning styles and needs. Furthermore, a study by Shih (2018) found a significant correlation between differentiated instruction practices and improved academic performance in a variety of disciplines. These findings are supported by additional research, including that of Connor et al. (2020), which highlights that differentiated teaching strategies can lead to higher academic achievement for students across various grade levels.

Table 6 Test of Relationship Between the Teachers' Level of Practice of Differentiated Instruction and Students' Academic Performance

Variable	R	p- value	Interpretation
Level of Practice Academic Performance	.702*	0.000	Strong Positive

*Correlation is significant at the 0.10 level (2-tailed)

Table 6 presents data on the relationship between the teachers' level of practice of differentiated instruction and students' academic performance. The table indicates a strong positive correlation (r = .702) between the teacher's level of practice of differentiated instruction and students' academic performance, with a highly significant p-value of 0.00001. This suggests that higher levels of differentiated instruction by teachers are associated with improved academic performance in students. A strong positive relationship exists between the practice of differentiated instruction by teachers and the academic performance of students. This finding implies that as teachers effectively implement differentiated strategies, students' academic performance tends to improve significantly.

Recent studies have shown that differentiated instruction positively influences student achievement. For example, a study by Ainsworth and Viegut (2016) found that differentiated instruction allows teachers to cater to diverse learning styles, which results in improved student performance. Similarly, Beattie, et al. (2017) demonstrated that tailoring instruction to individual student needs boosts their engagement and academic success. A study by Bayat and Güneş (2018) also revealed that students in classrooms where differentiated instruction was used showed significant improvements in their academic performance. Additionally, a 2020 study by Knight and Ritchie indicated that differentiated instruction contributes to better academic outcomes by addressing the specific learning gaps and strengths of students. Other research by Liu et al. (2021) showed that differentiated instruction enhances motivation and achievement, particularly in mixed-ability classrooms. Furthermore, Zhao (2019) emphasized that differentiation helps students understand the content at their own pace, thereby improving their academic results.achievement for students across various grade levels.

Table 7 Test of Relationship Between the Teachers' Level of Practice of Gamification and Students' Academic Competence

Variable	R	p- value	Interpretation
Level of Practice Academic Competence	.639*	0.000	Strong Positive

*Correlation is significant at the 0.10 level (2-tailed)

Table 7 presents data on the relationship between the teachers' level of practice of gamification and students'

academic competence. The table shows a strong positive correlation (r = .639) between the teacher's level of practice of gamification and students' academic competence, with a significant p-value of 0.00001. This indicates that as the use of gamification in teaching increases, students' academic competence tends to improve correspondingly.

There is a notable positive relationship between the extent to which teachers implement gamification strategies and the academic competence of students. This suggests that the more gamification techniques are integrated into the classroom, the more students demonstrate improved competence in their academic abilities.

Recent studies highlight the effectiveness of gamification in improving student competence. For instance, Anderson and Bunch (2017) found that incorporating game-based learning significantly boosted student motivation and academic performance. A study by Surendeleg et al. (2018) revealed that gamification increased student engagement, which in turn improved their academic skills. Additionally, Al-Emran et al. (2020) demonstrated that gamification encourages active learning, leading to higher academic achievement. A 2019 study by Yıldız et al. also indicated that students participating in gamified learning environments showed enhanced critical thinking and problem-solving abilities. Furthermore, research by Koivisto and Hamari (2019) confirmed that gamification has a substantial impact on student learning outcomes, particularly in higher education. Other studies, such as those by Deterding et al. (2017), show that gamification techniques, including points and rewards, can be powerful tools to enhance learning experiences and improve academic performance.

Table 8 Test of Relationship Between the Teachers' Level of Practice of Gamification and Students' Academic Performance

Variable	R	p- value	Interpretation
Level of Practice Academic Performance	.544*	0.000	Strong Positive

*Correlation is significant at the 0.10 level (2-tailed)

Table 8 presents data on the relationship between the teachers' level of practice of gamification and students' academic performance. The table indicates a moderate positive correlation (r = .544) between the teachers' level of practice of gamification and students' academic performance, with a highly significant p-value of 0.00001. This suggests that as teachers increasingly implement gamification strategies, students' academic performance tends to improve at a moderate level.

The positive relationship between the use of gamification in teaching and students' academic performance suggests that gamification strategies contribute to enhanced academic outcomes. While the correlation is moderate, the consistent use of gamified teaching methods appears to have a notable effect on how students perform academically.

Recent research emphasizes the positive impact of gamification on student performance. Studies by Surendeleg et al. (2018) and Anderson and Bunch (2017) demonstrated that gamification increases engagement, which directly affects academic performance. According to a study by Al-Emran et al. (2020), gamification enhances student participation and achievement through interactive and competitive learning environments. A study by Yıldız et al. (2019) further confirmed that students' performance improves when gamification techniques, such as badges and levels, are used in educational settings. Additionally, Koivisto and Hamari (2019) found that game-based learning in classrooms leads to improved academic outcomes, particularly in subjects requiring problem-solving skills. Other studies, like those by Deterding et al. (2017) and Seaborn & Fels (2019), have shown that when students are involved in a gamified learning process, they are more motivated and more likely to achieve higher performance scores. Research by Hamari, Koivisto, and Sarsa (2016) also revealed that gamification in higher education boosts student success by fostering a sense of achievement and progress. Furthermore, studies on the effects of gamification on cognitive development (like those by Deci et al., 2017 and Barata et al., 2017) have shown that gamified environments stimulate students to engage more deeply with the learning material, leading to higher academic performance.

CONCLUSION

Based on the findings of the study, the conclusions are the following:

The relationship between teachers' level of practices of differentiated instruction and gamification and the students' academic competence and performance. The results indicate that teachers consistently practice both differentiated instruction and gamification, with minimal variation in their implementation.

However, differentiated instruction appears to have a more significant impact on student outcomes compared to gamification.

Students in the "Differentiated Instruction" group exhibited higher academic competence and performance scores than those in the "Gamification" group. This was further supported by strong positive correlations between teachers' practice of differentiated instruction and both students' academic competence and performance.

On the other hand, while gamification strategies also showed positive correlations with academic competence and performance.

Overall, these results highlight the strong positive correlation on teachers' level of practice of differentiated instruction and gamification in improving students' academic outcomes and suggest that incorporating these strategies can contribute to student learning.

Therefore, educators may benefit from focusing on differentiated instruction while also exploring the potential of gamification to enhance student engagement and motivation.

RECOMMENDATION

In the light of the abovementioned conclusion, the following are the recommendations:

Offer professional development programs to equip educators with effective differentiated instruction and gamification strategies, fostering a supportive environment for innovative teaching practices.

Integrate differentiated instruction and gamification into teaching methods to address diverse learning needs, enhance engagement, and improve student performance. Regularly assess and adapt these strategies to ensure all students succeed.

Combine differentiated instruction and gamification within lessons to create dynamic, interactive learning experiences that promote critical thinking and problem-solving skills. Align these approaches with performance tasks to reinforce real-world applications.

Conduct studies to evaluate the long-term effects of these teaching strategies across various subjects and educational contexts, including diverse student populations. Explore the role of technology in enhancing the implementation of differentiated instruction and gamification.

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