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Innovative Game Board: A Strategy to Enhance the Least Learned Skills of Grade IV Learners

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Abstract. This study examined the effectiveness of implementing innovative game boards in enhancing the least learned skills of Grade IV learners in Mathematics within a school located in the District of Valladolid, Negros Occidental, during the School Year 2024-2025. Guided by constructivist learning theory, gamification theory, and Bloom's taxonomy, the research aimed to evaluate the extent of game board integration and its impact on students' mastery of core mathematical skills. A pretest-posttest experimental design was employed, involving 145 learners identified through quarterly examination scores as having the most difficulty in specific mathematical areas. Data were collected using self-developed instruments that were aligned with the identified least learned skills, and analyzed through the computation of mean scores, standard deviations, and t-tests. The results showed that, prior to the intervention, learners' skills ranged from nearly proficient to proficient across the grading periods. After the implementation of the game boards, there were noticeable improvements in students' performance, with mean scores rising to proficient and highly proficient levels. The t-test results indicated that the differences between pre- and post-intervention scores were statistically significant across all grading periods, confirming the positive effect of the game-based strategies. The findings demonstrated that the use of game boards effectively enhanced students' understanding, engagement, and mastery of fundamental mathematical concepts. The study concluded that interactive, game-based instructional strategies had a significant positive influence on learners' skills, helping to reduce learning gaps and promote higher-order thinking skills. These results supported the integration of innovative game-based tools in primary education, particularly to improve mathematical proficiency and address specific learning deficiencies among young students.

Introduction

In the Philippines, students in Grade IV continued to struggle with mastering fundamental skills in core subjects like Mathematics and Science, which hampered their overall academic performance and readiness for higher concepts (DepEd, 2021). Although the board games mentioned in these informal sources had yet to attract much academic research, they were extensively discussed informally by experts in these areas. Moreover, some board game manufacturers had already considered children's development in domains such as language when designing their games, even producing pamphlets along with their games containing tips for parents (HABA, 2016).

The goal was to help both academic and nonacademic audiences gain a more detailed picture of what was known so far about young children's learning from board games. Further knowledge and organization of this literature could have benefitted a wider audience of parents, educators, other professionals, and community members wishing to provide rich learning experiences to children in at least two ways. First, it could have offered a wider scope of board game learning to inform a game's design (and to evaluate such games for purchase and use). Second, those observing children playing a game could have better understood and recognized the full breadth of rich learning opportunities and experiences taking place.

Indeed, the findings exceeded expectations in terms of the number of domains and surprised researchers in terms of the lack of experimental research in some domains, which was suggested to be worthy of further investigation.

In the Philippines, Grade IV students continue to struggle with mastering fundamental skills in Mathematics and Science, impacting their academic progress and ability to grasp higher-level concepts. Despite the potential of game-based learning, particularly through innovative game boards, there was a lack of formal research on their effectiveness, especially in Mathematics education. Existing literature primarily highlights the general benefits of games for engagement and motivation but fails to address how game boards could target specific learning deficits. This gap in research limits the application of game-based learning in the classroom, particularly in the Philippine context.

Therefore, this study aimed to explore the implementation of innovative game boards in Mathematics and assess their influence on enhancing the least learned skills of Grade IV learners in a school in Negros Occidental during the 2024-2025 school year.

Methodology

This study employs a single pretest-posttest ABA (A-B-A) experimental design, involving three phases—baseline, intervention, and return to baseline—to observe the effects of innovative game boards on Grade IV learners' least learned skills in Mathematics, with Kazdin (2011) noting its strength in establishing causal relationships. The respondents are 145 Grade IV learners from a school in Negros Occidental, identified through total enumeration, focusing on the top five least learned skills based on quarterly exam scores. Data was gathered using self-made, validated instruments comprising 5-item multiple-choice questions aligned with these skills, with four pretest and posttest sets administered after exposure to the intervention; validity was rated at 4.21 and reliability at .9957 using KR-20, analyzed via the KR-20 online calculator. The researcher obtained necessary permissions, and data analysis involved calculating means and standard deviations to assess learners' skill levels before and after the intervention, and an independent t-test to evaluate significant differences. Ethical considerations included obtaining informed consent from students and guardians, ensuring confidentiality, avoiding coercion, and adhering to institutional standards to protect participants' well-being and data privacy throughout the research process.

Results and Discussion

Level of Least Learned Skills of Learners in Mathematics IV per Grading Period before the

Implementation of the Intervention

The pre-intervention assessment of Grade IV learners' least learned skills in Mathematics showed a nearly proficient average score of 74.32% across the grading periods, with mastery of place value for larger numbers (80.15%) being the highest, while applying basic geometric concepts (71.00%) was the lowest, indicating nearly proficient performance. This suggests that students were able to grasp foundational concepts like place value but struggled with applying geometric skills, reflecting a common pattern where elementary learners more easily master number concepts than spatial and geometric reasoning, which require higher-order thinking. According to Sakal et al. (2020) worksheets are important materials that enable students to organize their knowledge, including the steps of what the students need to do, and which ensure participation in the activity of the whole class at the same time.

INDICATORS	PRETEST	
	Mean Percentage Score (MPS)	***Interpretation***
1. Understanding and applying fractions in real-world contexts (Liza has 3/4 of a chocolate bar. She gives 1/8 of the chocolate bar to her brother. How much of the chocolate bar does Liza still have? A) 5/8; B) 5/4; C) ½; D) 3/8)	70.10	Nearly Proficient
2. Solving multi-step word problems involving basic operations (Carlos has 48 marbles. He gives 1/3 of his marbles to his friend and then buys 10 more marbles. How many marbles does Carlos have now? A) 24; B) 26; C) 30; D) 28)	71.15	Nearly Proficient
3. Mastery of place value concepts for larger numbers (What is the value of the digit 7 in the number 7,854? A) 700; B) 7,000; C) 70; D) 700,000)	80.15	Proficient

4.	Applying basic geometric concepts (Which of the following angles is a right angle? A) An angle that measures 45°; B) An angle that measures 90°; C) An angle that measures 120°; D) An angle that measures 180°)	71.00	Nearly Proficient
5.	Interpreting data from simple graphs (The bar graph shows the number of students who like different fruits. If 10 students like bananas, 15 like apples, and 20 like oranges, which fruit is the most liked? A) Bananas; B) Apples; C) Oranges; D) All are liked equally)	79.19	Proficient
	Average Mean Percentage Score (MPS)	**74.32**	**Nearly Proficient**

Table 1.1 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period before the Implementation of the Intervention during 1st Grading Period

In the second grading period, Grade IV learners demonstrated a proficient average score of 75.84% in least learned skills, with the highest performance in converting units of measurement (79.04%) and the lowest in interpreting data from bar graphs and pictographs (71.89%), which was nearly proficient. According to Mortensen and Smart (2020) identify worksheets as a strategy that allows them to control their own learning because it allows them to decide how and where to use the assigned tasks. Umriani et al. (2020) also support the use of worksheets, indicating that students who regularly practiced with worksheets showed notable improvements in their mathematical abilities. Their findings suggest that worksheets serve as effective tools for reinforcing concepts and providing practice opportunities. Moreover, the study highlighted that worksheets help in identifying students' misconceptions and addressing them promptly. Consequently, this study aligns with the idea that worksheets contribute positively to developing numeracy skills in learners.

INDICATORS	**PRETEST**	
	Mean Percentage Score (MPS)	***Interpretation***
1. Converting between different units of measurement (If a car travels 150 kilometers in 3 hours, how many meters does it travel in one second? Hint: 1 km = 1,000 meters, 1 hour = 3,600 seconds A) 13.89 meters per second; B) 41.67 meters per second; C) 125 meters per second; D) 150 meters per second)	79.04	Proficient
2. Understanding decimal numbers and their applications (A basket contains 3.75 kilograms of mangoes. If you want to pack the mangoes equally into 5 boxes, how many kilograms of mangoes will each box contain? A) 0.75 kg; B) 1.25 kg; C) 0.85 kg; D) 0.65 kg)	79.02	Proficient
3. Applying concepts of symmetry and basic transformations (A butterfly has wings that are mirror images of each other. This is an example of which type of symmetry? A) Rotational symmetry; B) Asymmetry; C) Reflection symmetry; D) Translational symmetry)	76.12	Proficient
4. Solving problems involving time and elapsed duration (Juan started doing his homework at 4:15 PM and finished at 5:40 PM. How long did Juan take to complete his homework? A) 1 hour and 15 minutes; B) 1 hour and 25 minutes; C) 1 hour and 35 minutes; D) 1 hour and 45 minutes)	73.13	Nearly Proficient
5. Interpreting data from bar graphs and pictographs (A bar graph shows the number of students who like different fruits: Apples (20 students), Bananas (35 students), Mangoes (15 students), and Oranges (25 students). Which fruit is the most liked? A) Apples; B) Bananas; C) Mangoes; D) Oranges)	71.89	Nearly Proficient
Average Mean Percentage Score (MPS)	**75.84**	**Proficient**

Table 1.2 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period before the Implementation of the Intervention during 2nd Grading Period

The third grading period revealed that Grade IV learners' least learned skills in Mathematics were nearly proficient, with an average score of 70.93%, though there was a notable gap in higher-order thinking skills. Recognizing patterns and sequences (79.24%) was the strongest area, while using mathematical reasoning for problem-solving (67.13%) lagged, indicating a need to develop students' reasoning abilities for tackling complex problems. The study by Gallardo-Saavedra

et al. (2021) and Ramos et al. (2021) also supports the development of worksheets, as both studies report improvements in learners' mathematical understanding and skills when worksheets are employed. Gallardo-Saavedra et al. noted that worksheets promote active learning and self-assessment, leading to better numeracy outcomes. Similarly, Ramos et al. found that worksheet-based activities foster independent problem-solving and confidence among students. In conclusion, these studies collectively affirm that worksheets play a significant role in improving learners' numeracy skills.

INDICATORS	PRETEST	
	Mean Percentage Score (MPS)	***Interpretation***
1. Understanding and solving problems involving perimeter and area (A rectangular garden measures 8 meters in length and 5 meters in width. If a walkway of 1 meter wide is built all around the garden, what is the total area of the walkway? A) 18 square meters; B) 20 square meters; C) 28 square meters; D) 30 square meters)	68.11	Nearly Proficient
2. Working with simple fractions and their equivalents (Which of the following fractions is equivalent to 3/4? A) 6/8; B) 9/12; C) 12/16; D) All of the above)	73.01	Nearly Proficient
3. Recognizing patterns and sequences (What is the next number in the sequence: 2, 4, 8, 16, ___? A) 18; B) 24; C) 32; D) 6)	79.24	Proficient
4. Applying basic concepts of probability (A bag contains 3 red balls, 2 blue balls, and 5 green balls. If one ball is randomly picked, what is the probability that it is not green? A) ½; B) 3/5; C) 2/5; D) 4/10)	67.16	Nearly Proficient
5. Using mathematical reasoning for problem-solving (Liza has 3 times as many stickers as Carla. If Carla has 7 stickers, how many stickers do they have together? A) 14, B) 21; C) 28; D) 35)	67.13	Nearly Proficient
Average Mean Percentage Score (MPS)	**70.93**	**Nearly Proficient**

Table 1.3 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period before the Implementation of the Intervention during 3rd Grading Period

The fourth grading period showed that Grade IV learners' least learned skills in Mathematics were nearly proficient, with an average score of 75.07%, yet gaps remained in foundational concepts crucial for higher-order problem-solving. While solving problems involving averages (79.12%) was the strongest area, applying ratios and proportional reasoning (69.01%) lagged, highlighting the need to enhance instructional strategies in these key areas. Piamsai (2020), highlights the importance of guided learning, where educators provide structured support to help students progressively build their understanding.

This approach aligns with the current approach to proficiency performance of learners, as it suggested that the gradual improvement observed was a result of effective instructional support. Through offering step-by-step guidance and adjusting assistance based on student needs, educators help learners develop deeper comprehension.

INDICATORS	PRETEST	
	Mean Percentage Score (MPS)	***Interpretation***
1. Applying ratios and proportional reasoning (Lina has 3 red apples and 6 green apples. If she wants to keep the same ratio of red to green apples in a new basket, how many green apples should she put in the basket if she adds 3 red apples? A) 6 green apples; B) 9 green apples; C) 12 green apples; D) 18 green apples)	69.01	Nearly Proficient
2. Solving problems involving averages (A class of 40 students took a quiz. The average score was 75. If 10 students scored 80, what was the average score of the remaining students? A) 70; B) 73; C) 75; D) 77)	79.12	Proficient
	79.05	Proficient

3. Understanding basic algebraic expressions (If x+5=12, what is the value of x? A) 5, B) 7, C) 12, D) 17)	75.12	Proficient
4. Interpreting more complex graphs and charts (The bar graph shows the number of books read by students in different months: January: 20 books, February: 15 books, March: 25 books, April: 10 books: Which month had the highest number of books read? A) January, B) February, C) March, D) April)	73.03	Nearly Proficient
5. Applying mathematical concepts to real-life situations (Juan has a rope that is 3 meters long. He cuts the rope into pieces that are each 0.75 meters long. How many pieces does he get? A) 3, B) 4, C) 5, D) 6)		
Average Mean Percentage Score (MPS)	**75.07**	**Proficient**

Table 1.3 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period before the Implementation of the Intervention during 4th Grading Period

Level of Least Learned Skills of Learners in Mathematics IV per Grading Period after the Implementation of the Intervention

Before implementing the intervention, quarterly examination reports showed that Grade IV learners' least learned skills in Mathematics were generally proficient, with an average score of 86.31% in the first grading period. While mastery of place value concepts for larger numbers (89.13%) was the highest, understanding and applying fractions in real-world contexts (82.16%) was the lowest, though still proficient. Enhancing students' understanding of fractions through real-world applications is vital for developing critical thinking and practical problem-solving skills, which can help bridge mastery gaps and promote equitable learning. Piamsai (2020), supports the findings of the study by highlighting how guided support enhances learners' understanding and skill development. The theory emphasizes that providing appropriate assistance helps learners progress from their current level to higher levels of competence, which aligns with the observed improvement in numeracy skills after using the developed worksheets. Therefore, the results indicating learners' approaching proficiency performance can be understood as a direct outcome of effective scaffolding, validating the theory's assertion that structured support facilitates learning and skill mastery.

INDICATORS	**POST TEST**	
	Mean Percentage Score (MPS)	***Interpretation***
1. Understanding and applying fractions in real-world contexts (Lyla has 3/4 of a chocolate bar. She gives 1/8 of the chocolate bar to her brother. How much of the chocolate bar does Lyla still have? A) 5/8; B) 5/4; C) ½; D) 3/8)	82.16	Proficient
2. Solving multi-step word problems involving basic operations (Carlson has 48 marbles. He gives 1/3 of his marbles to his friend and then buys 10 more marbles. How many marbles does Carlson have now? A) 24; B) 26; C) 30; D) 28)	85.02	Proficient
3. Mastery of place value concepts for larger numbers (What is the value of the digit 7 in the number 7,854? A) 700; B) 7,000; C) 70; D) 700,000)	89.13	Proficient
4. Applying basic geometric concepts (Which of the following angles is a right angle? A) An angle that measures 45°; B) An angle that measures 90°; C) An angle that measures 120°; D) An angle that measures 180°)	88.09	Proficient
5. Interpreting data from simple graphs (The bar graph shows the number of students who like different fruits. If 10 students like bananas, 15 like apples, and 20 like oranges, which fruit is the most liked? A) Bananas; B) Apples; C) Oranges; D) All are liked equally)	87.14	Proficient
Average Mean Percentage Score (MPS)	**86.31**	**Proficient**

Table 2.1 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period after the Implementation of the Intervention during 1st Grading Period

The second grading period revealed that Grade IV learners' least learned skills in Mathematics were generally proficient, with an average score of 89.14%, indicating effective instructional strategies. While applying concepts of symmetry and basic transformations (90.12%) was highly proficient, and converting between measurement units (88.07%) was

proficient, the slight score differences suggest the need for ongoing refinement of teaching methods to ensure all students achieve full mastery, especially in more complex areas. Similarly, Riyati and Suparman (2019) emphasized the importance of mathematical communication skills in 21stcentury learning, demonstrating that problem-based learning worksheets significantly improve these skills. In this context, the current study's face validity assessment supports these findings, affirming that the developed worksheet enhances clarity, engagement, and usability, much like the Mathematics Learning Strategy Module.

INDICATORS	POST TEST	
	Mean Percentage Score (MPS)	***Interpretation***
1. Converting between different units of measurement (If a boat travels 150 kilometers in 3 hours, how many meters does it travel in one second? Hint: 1 km = 1,000 meters, 1 hour = 3,600 seconds A) 13.89 meters per second; B) 41.67 meters per second; C) 125 meters per second; D) 150 meters per second)	88.07	Proficient
2. Understanding decimal numbers and their applications (A box contains 3.75 kilograms of mangoes. If you want to pack the mangoes equally into 5 baskets, how many kilograms of mangoes will each basket contain? A) 0.75 kg; B) 1.25 kg; C) 0.85 kg; D) 0.65 kg)	89.33	Proficient
3. Applying concepts of symmetry and basic transformations (A moth has wings that are mirror images of each other. This is an example of which type of symmetry? A) Rotational symmetry; B) Asymmetry; C) Reflection symmetry; D) Translational symmetry)	90.12	Highly Proficient
4. Solving problems involving time and elapsed duration (John started doing his homework at 4:15 PM and finished at 5:40 PM. How long did John take to complete his homework? A) 1 hour and 15 minutes; B) 1 hour and 25 minutes; C) 1 hour and 35 minutes; D) 1 hour and 45 minutes)	89.11	Proficient
5. Interpreting data from bar graphs and pictographs (A bar graph shows the number of students who like different fruits: Watermelon (20 students), Soursop (35 students), Durian (15 students), and Guava (25 students). Which fruit is the most liked? A) Watermelon; B) Soursop; C) Durian; D) Guava)	89.09	Proficient
Average Mean Percentage Score (MPS)	**89.14**	**Proficient**

Table 2.2 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period after the Implementation of the Intervention during 2nd Grading Period

The third grading period showed that Grade IV learners' least learned skills in Mathematics were generally proficient, with an average score of 88.58%, reflecting effective teaching strategies. While understanding and solving perimeter and area problems (90.19%) was highly proficient, the slightly lower score in using mathematical reasoning for problem-solving (86.34%) indicates opportunities to strengthen critical thinking and logical reasoning skills. Incorporating reasoning-based and inquiry-driven activities into instruction. Aunio (2019), who emphasized the significance of early numeracy skills in fostering mathematical competence and the necessity for valid and reliable assessment tools to identify students at risk. Furthermore, early intervention based on accurate assessments can significantly improve students' long-term mathematical outcomes. Ensuring the use of standardized tools allows educators to tailor instruction to meet individual student needs effectively. Ultimately, developing such assessment strategies is crucial for promoting equitable learning opportunities in mathematics education.

INDICATORS	POST TEST	
	Mean Percentage Score (MPS)	***Interpretation***
1. Understanding and solving problems involving perimeter and area (A rectangular garden measures 8 meters in length and 5 meters in width. If a walkway of 1-meter-wide is built all around the garden, what is the total	90.19	Highly Proficient

	area of the walkway? A) 18 square meters; B) 20 square meters; C) 28 square meters; D) 30 square meters)	89.45	
2.	Working with simple fractions and their equivalents (Which of the following fractions is equivalent to 3/4? A) 6/8; B) 9/12; C) 12/16; D) All of the above)	89.78	Proficient
3.	Recognizing patterns and sequences (What is the next number in the sequence: 2, 4, 8, 16, ___? A) 18; B) 24; C) 32; D) 6)	87.12	Highly
4.	Applying basic concepts of probability (A bag contains 3 red balls, 2 blue balls, and 5 green balls. If one ball is randomly picked, what is the probability that it is not green? A) ½; B) 3/5; C) 2/5; D) 4/10)	86.34	Proficient
5.	Using mathematical reasoning for problem-solving (Liza has 3 times as many stickers as Carla. If Carla has 7 stickers, how many stickers do they have together? A) 14, B) 21; C) 28; D) 35)		Proficient
			Proficient
	Average Mean Percentage Score (MPS)	**88.58**	**Proficient**

Table 2.3 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period after the Implementation of the Intervention during 3rd Grading Period

The fourth grading period revealed that Grade IV learners were generally proficient in Mathematics, with an average score of 88.32%, reflecting effective instruction. Their strongest skill was interpreting complex graphs and charts (90.90%), demonstrating good analytical abilities, while solving problems involving averages (85.05%) was relatively weaker, indicating a need to strengthen understanding of statistical concepts. Incorporating real-life data analysis activities and visual literacy, as emphasized by Rakhmawati and Mustadi (2022) supports the positive impact of using developed worksheets on learners' numeracy skills. Their research indicates that students who engaged with specially designed worksheets showed significant improvement in their understanding and application of mathematical concepts. Similarly, the post-test results in the current study demonstrate a notable increase in learners' numeracy abilities after utilizing the developed worksheets. Therefore, both studies collectively suggest that well-designed instructional materials can effectively enhance learners' numeracy skills.

	INDICATORS	**POST TEST**	
		Mean Percentage Score (MPS)	***Interpretation***
1.	Applying ratios and proportional reasoning (Lina has 3 red apples and 6 green apples. If she wants to keep the same ratio of red to green apples in a new basket, how many green apples should she put in the basket if she adds 3 red apples? A) 6 green apples; B) 9 green apples; C) 12 green apples; D) 18 green apples)	89.98	Highly Proficient
2.	Solving problems involving averages (A class of 40 students took a quiz. The average score was 75. If 10 students scored 80, what was the average score of the remaining students? A) 70; B) 73; C) 75; D) 77)	85.05	Proficient
3.	Understanding basic algebraic expressions (If x+5=12, what is the value of x? A) 5, B) 7, C) 12, D) 17)	89.80	Highly Proficient
4.	Interpreting more complex graphs and charts (The bar graph shows the number of books read by students in different months: January: 20 books, February: 15 books, March: 25 books, April: 10 books: Which month had the highest number of books read? A) January, B) February, C) March, D) April)	90.90	Proficient
5.	Applying mathematical concepts to real-life situations (Juan has a rope that is 3 meters long. He cuts the rope into pieces that are each 0.75 meters long. How many pieces does he get? A) 3, B) 4, C) 5, D) 6)	85.89	Proficient
	Average Mean Percentage Score (MPS)	**88.32**	**Proficient**

Table 2.4 Level of Least Learned Skills of Learners in Mathematics IV per Grading Period after the Implementation of the Intervention during 4th Grading Period

Difference between the Level of Least Learned Skills of Learners in Mathematics 4 per Grading Period before and after the Implementation of the Intervention

The analysis of quarterly examination reports revealed significant differences between pretest and post-test results across all four grading periods (1st: t=8.861, p=000; 2nd: t=10.299, p=000; 3rd: t=10.075, p=000; 4th: t=6.469, p=000), indicating that the null hypothesis was rejected and suggesting that the implementation of the Game Board intervention effectively enhanced Grade IV students' least learned skills in Mathematics. Supporting recent research by Choycawen et al. (2024), which investigated the effectiveness of supplementary materials in teaching mathematics. Their research found that learners using supplementary materials were able to answer more effectively by applying what they had learned from their reading. The materials helped students retain information, receive tutoring, track progress, and connect their knowledge to a broader context. Additionally, learners who followed structured instructions and processes within the materials demonstrated higher engagement and performance.

Level of Teaching Approaches (Assessed by Faculty & Students)	***t-test value***	***p-value***	***Interpretation***
1ST Grading (Pre-Post)	8.861	.000	Significant
2nd Grading (Pre-Post)	10.299	.000	Significant
3rd Grading (Pre-Post)	10.075	.000	Significant
4th Grading (Pre-Post)	6.469	.000	Significant

Table 3. Difference between the Pretest and Post Test Result Before and After the Implementation of Game Board per Grading Period

Conclusion and Recommendations

The findings of this study clearly demonstrate that the implementation of the intervention, specifically the use of Game Boards, has resulted in significant improvements in the least learned skills of Grade IV learners in Mathematics across all grading periods. Prior to the intervention, learners exhibited nearly proficient to proficient levels in various mathematical indicators, with scores showing room for growth, particularly in higher-order thinking skills such as applying geometric concepts, interpreting data from graphs, and solving complex problems. Post-intervention results revealed a marked increase in their performance, with mean percentage scores rising to proficient and highly proficient levels, indicating enhanced understanding and mastery of key mathematical concepts. The statistically significant differences between pretest and post-test scores, supported by the t-test analysis, further confirm the effectiveness of the game-based approach in fostering active engagement, improving conceptual understanding, and developing critical thinking skills among young learners. This compelling evidence underscores the transformative power of interactive, game-based strategies in mathematics instruction, not only addressing learning gaps but also inspiring a love for learning, boosting confidence, and laying a strong foundation for future academic success.

Acknowledgement

The researchers found that using Game Boards as an intervention significantly improved the math skills of Grade IV students, especially in higher-order thinking areas. Prior to the intervention, students showed room for growth, but after implementation, their scores increased to proficient levels, indicating better understanding and mastery of key concepts. Statistical analysis confirmed the effectiveness of this game-based approach in enhancing engagement, comprehension, and critical thinking. Overall, the study highlights the positive transformative impact of interactive, game-based strategies in mathematics education, fostering a love for learning, confidence, and a solid foundation for future success.

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Competing Interests Statement

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Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study; all data used were obtained from previously published sources as cited in the reference list.

References

Arifanti, D. R., Raupu, S., Thalhah, S. Z., & Ikram, M. (2024). An Analysis of Students'Mathematical Reasoning in Solving Probability Problems Judging from Learning Styles: The Converger. Uniciencia, 38(1), 587-606. https://doi.org/10.15359/ru.38-1.32.

Aunio, P. (2019). Early numeracy skills learning and learning difficulties—evidence-based assessment and interventions. In Cognitive foundations for improving mathematical learning (pp. 195-214). Academic Press. https://doi.org/10.1016/B978-0-12-815952-1.00008-6

Choycawen, M., Pagdawan, R., & Canuto, P. P. (2024). Unveiling the benefits and challenges of using printed modules during pandemic: Examining university teachers' experiences in a higher education institution. SSRN. https://ssrn.com/abstract=5036154

Department of Education. (2021). Philippine Basic Education Curriculum: Learner outcomes and competencies. https://www.deped.gov.ph

Gallardo-Saavedra, S., Morales-Aragonés, I., Alonso-Gómez, V., Sánchez-Pacheco, F. J., González, M. A., Martínez, O., ... (2021). Low-cost electronics for online IV tracing at photovoltaic module level: Development of two strategies and comparison between them. Electronics, 10(6), 671. https://www.jetir.org/papers/JETIR2505844.pdf

HABA. 2016. "My Very First Games: Hanna Honeybee." Hanna Honeybee. Game instructions. https://files.eric.ed.gov/fulltext/EJ1357958.pdf

Kazdin, A. E. (2011). Single-case research designs: Methods for clinical and applied settings (2nd ed.). Oxford University Press.

Mortensen, M. F., & Smart, K. (2017). Free-choice worksheets increase students' exposure to curriculum during museum visits. Journal of Research in Science Teaching, 44(9), 1389-1414. https://doi.org/10.1002/tea.21372.

Piamsai, C., & Chulalongkorn University Language Institute. (2020). The effect of scaffolding on non-proficient EFL learners' performance in an academic writing class. LEARN Journal: Language Education and Acquisition Research Network Journal, 13(2), 288–289. https://www.jetir.org/papers/JETIR2505844.pdf

Rahmawati, D., Vahlia, I., Mustika, & Yunarti, T. (2022). Validity analysis of development of Socrates-based linear algebra e-modules. Education Quarterly Reviews, 5(2). https://doi.org/10.31004/educationquarterly.v5i2.4119287

Ramos, V. F. C., Cechinel, C., Magé, L., & Lemos, R. (2021). Student and lecturer perceptions of usability of the virtual programming lab module for Moodle. Informatics in Education, 20(2). https://www.jetir.org/papers/JETIR2505844.pdf

Ransom, M., & Manning, M. (2015). Teaching strategies: Worksheets, worksheets, worksheets. Childhood Education, 89(3), 188-190. https://doi.org/10.1080/00094056.2013.792707

Riyati, I., & Suparman, S. (2019). Design student worksheets based on problem-learning to enhance mathematical communication. Asian Journal of Assessment in Teaching and Learning, 9(2), 10-19. https://doi.org/10.37134/ajatel.vol9.no2.2.2019

Sakal, A., Arzu, & Akdeniz, A. R., & Enginar, İ. (2020). Biyoloji öğretiminde duyularımız konusunda çalışma yapraklarının geliştirilmesi ve uygulanması. V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, 16-18 Eylül, ODTÜ Kültür ve Kongre Merkezi, Ankara. https://www.jetir.org/papers/JETIR2505844.pdf

Supriadi, N., & Suherman, S. (2024). The role of learning anxiety and mathematical reasoning as predictor of promoting learning motivation: The mediating role of mathematical problem solving. Thinking Skills and Creativity, 52, 101497. https://doi.org/10.1016/j.tsc.2024.101497

Supriadi, N., Jamaluddin, Z. W., & Suherman, S. (2024). The role of learning anxiety and mathematical reasoning as predictor of promoting learning motivation: The mediating role of mathematical problem solving. Thinking Skills and Creativity, 52, 101497. https://doi.org/10.1016/j.tsc.2024.101497

Szabo, A., Tillnert, A. S., & Mattsson, J. (2024). Displaying gifted students' mathematical reasoning during problem solving: Challenges and possibilities. The Mathematics Enthusiast, 21(1), 179-202. https://doi.org/10.54870/1551-3440.1623.

Umriani, F., Suparman, Y. H., & Sari, D. P. (2020). Analysis and design of mathematics student worksheets based on PBL learning models to improve creative thinking. International Journal of Advanced Science and Technology, 29(7s), 226-237. https://www.jetir.org/papers/JETIR2505844.pdf

Appendices

No appendices are attached to this study.