



Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)

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ABSTRACT

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This action research explores the impact of an innovative game-based intervention entitled “Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics),” on the academic performance of grade 7 students at Mount Carmel College of Casiguran, Inc., academic year 2024-2025. The research employs a quasi-experimental design with purposive sampling consisting of an experimental and control group, wherein the experimental group undergoes the intervention. A validated 30-item pre-test and post-test was the main instruments for this study and administered to 52 participants (26 experimental group and 26 control group) to measure the academic performance of both group. This game-based intervention was designed to foster critical thinking and strengthen mathematical skills over 20 days. Results revealed significant differences among learners exposed to Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics). The experimental group's post-test mean score increased to outstanding, compared to the control group's Did Not Meet Expectations. Statistical analysis confirmed a significant difference between the two groups' performances post-intervention, with a very large effect size indicated. Additionally, a dependent t-test for the experimental group showed a notable improvement from their pre-test mean score. The study's findings highlighted the effectiveness of Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) as an innovative educational tool addressing mathematical challenges and enhancing foundational skills. It also offers valuable insights for educators, emphasizing the importance of engaging and interactive pedagogies in improving learner outcomes in mathematics.

KEYWORDS:

Math SCRABBLE,
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operations on rational
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CONTEXT AND RATIONALE

Mathematics is a science and system that comprises axioms, principles, and concepts that deal with numbers, measurements, and space. It is a branch of knowledge that

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uses logical reasoning and critical thinking to formulate a concrete theorem. Thus, its nature is not limited theoretically, nor can it be done without practical application; it is vital in applying it to real-world problems as it serves as a language or a code to understand our world. It can be used as a basis for innovations, inventions, and discoveries inside society (Gravemeijer, 2016). Consequently, understanding mathematics requires individuals first to grasp the foundation to comprehend its nature fully.

Solving integers is the foundational element of mathematics. Its concept forms the groundwork for algebra learning and is considered a prerequisite for mathematics

(Cetin, 2019). Without the knowledge of the basics, an individual can't advance to more advanced and complex ideas. In the present day, solving integers is increasingly a problem.

Difficulties in solving fundamental integer problems have been publicly documented throughout the globe, mainly in solving addition and subtraction (Goh, Tengah et al., 2017; Khalid et al., 2018; Makonye & Fakude, 2016). And it poses a global challenge for students, including elementary, secondary, and college students, and even in pre-service teachers, who have trouble dealing with integers (Utomo & Priyo, 2020; Khalid & Embong, 2020).

Similarly, a research paper from Dea Permata et al. 2019 entitled "Students' misconceptions on the algebraic prerequisites concept: causative factors and alternative solutions" states how students have misunderstood the concept of solving integers. The authors state that subtracting positive and negative integers is a common difficulty for learners. They tend to subtract large numbers from small values and put the wrong sign in their answers. Division misinterpretation is also a struggle for the students; they perceive division as repeated subtraction rather than understanding it as the operation that indicates how many times one number can be accommodated within another number. The least common misconception is multiplying by zero. Intuition and misconceptions and educational strategies emphasize the problem.

In addition, Makonye et al., in their study in 2016, got the same result. The confusion with signage was evident. The misconception about subtracting negative and positive numbers and the lack of conceptual understanding are the reasons why learners have difficulties dealing with integers.

Learners often have difficulties with integers and performing the basic operations on rational numbers. In their 2019 studies, Jessica Namkung and Lynn Fuchs found that learners with severe mathematical comprehension make common errors in applying the whole number concept to fractions. This is because fraction operations differ from whole number and integer operations.

In the Philippines, this was not a surprise. The research journal of Janina C. Sercenia¹, Edwin D. Ibañez, and Jupeth T. Pentang entitled "Thinking Beyond Thinking: Junior High School Students' Metacognitive Awareness and Conceptual Understanding of Integer" reveals several difficulties that the learners faced in understanding the concept of integers. Misconceptions and confusion arise when applying the operations in negative numbers, commonly in subtraction. Students tend to mix up whenever a negative number arises. Poor performance in applying the properties was also present in the study, where they poorly recognized and used the properties of integers, such as closure, associative, distributive, identity, and commutative properties.

Further, it also explains why the Philippines performed poorly in the recent PISA (Programme for International Student Assessment) for the mathematics assessment in 2022. Based on the result of the mathematics assessment, only 16% of Filipino students reached at least level 2 in terms of proficiency in mathematics, which is much lower than the standard given by the OECD by 69%.

In addition, the analysis of the 3rd Quarterly Examination scores for Grade 7 learners at Mount Carmel College of Casiguran Inc. reveals that the average score of 26.66, or 53.32% of the total, was below the Minimum Proficiency Level (60%) given by the Department of Education. The 3rd quarterly examination specifically included the topic of performing operations with integers and rational numbers, which serves as a springboard in understanding higher mathematical concepts. Thus, this suggests that students have not met academic expectations, emphasizing the need for targeted interventions to enhance their understanding of essential concepts and skills.

Considering these circumstances, the MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) was formulated to improve learners of grade 7 from Mount Carmel College of Casiguran Inc. in performing the basic operations of integers and rational numbers. Just like how the game Scrabble requires its player to form a word, the Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) enables the learner to create an equation within the game. It aims to help the learner understand how basic operations work on integers and rational numbers, develop critical thinking, and mitigate the number of illiterates in learners. The game will be played from Monday to Thursday after their afternoon class to enhance their skills in problem-solving.

CONCEPTUAL FRAMEWORK

The conceptual framework that was used in the study is the Input-Process-Output Model as shown in the figure below. The IPO Model was used to show how the process done in conducting the Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics). Within the IPO Model, the process is depicted by the series of boxes, and each representing key activities.

The Input phase includes seeking for approval from the school head and parents to voluntarily participation of the learners. Preparation of the materials to be used for the intervention and conducting the pre-test to assess the learner's prior knowledge.

The Process phase includes the implementation of the intervention to the learners as enhancement, conducting a post-test to assess the effectiveness of the intervention, collection of data from the learners, and the interpretation of the data gathered from the post-test.

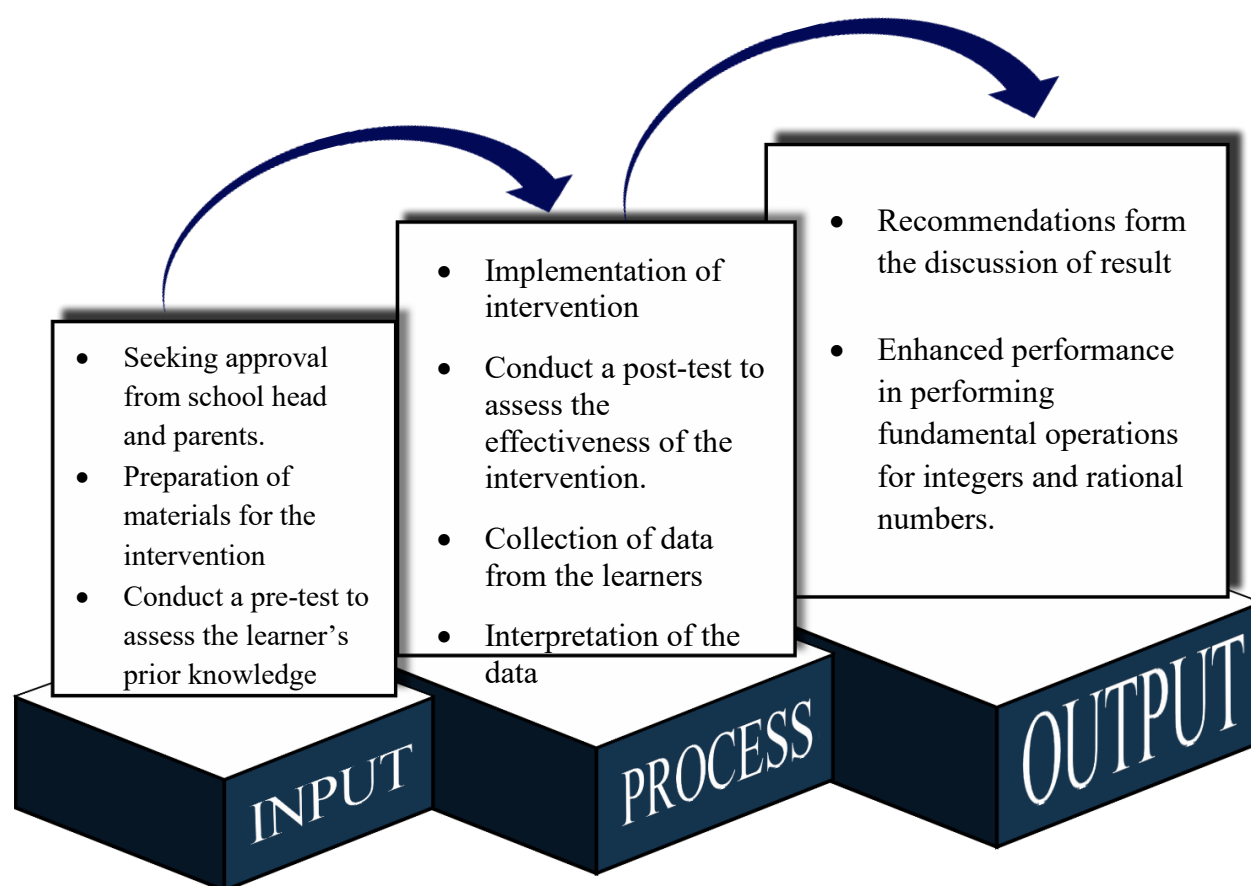
The Output phase includes the recommendations from the discussion of result and the enhanced performance in performing the fundamental operations for integers and rational numbers.

Research Questions

This study seeks to determine the efficacy of the intervention “Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)” in students' academic performance in Mathematics of Grade 7 learners in Mount Carmel College of Casiguran, Inc.

It seeks to find the answer to the following questions:

1. What is the level of academic performance of Grade 7 learners in the control and experimental groups before the intervention?



2. What is the level of academic performance of Grade 7 learners in the control and experimental groups after the intervention?
3. Is there a significant difference in the academic performance of Grade 7 learners in the control and experimental groups in Mathematics after the intervention?
4. Is there a significant difference in the academic performance of Grade 7 learners in the experimental group between the pretest and posttest results?

Hypothesis

1. There is no significant difference in the academic performance of the learners in the control and experimental group after the intervention.
2. There is no significant difference in the academic performance of Grade 7 learners in the experimental group between the pretest and posttest results.

Significance of the Study

This study was beneficial to the following groups:

Grade 7 Students of Mount Carmel College of Casiguran, Inc. Participating in the intervention may help to

enhance their understanding in performing operations in integers and rational numbers.

Teachers. The findings serve as a reference for Math teachers who want to apply similar strategies in their classes to enhance students' math skills. The Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) can be used as an instructional material for their project, programs, and activity implementation like National Mathematics Program etc.

School Administrators. The study provides insights that may support efforts to reduce the number of students struggling in numeracy.

Future Researchers. The study can be a reference for future researchers who wish to venture in conducting studies with the same or similar topic.

Scope and Limitations

The study aimed to assess the level of academic performance of Grade 7 learners of Mount Carmel College of Casiguran, Inc. for the academic year 2024-2025. The evaluation of their performance in mathematics was based on implementing the intervention "Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)": An Innovative Game-Based Approach in Improving Learners' Performance in Basic Operations of Integers and Rational Numbers. Additionally, it aimed to measure the efficacy of the intervention to the learners' academic performance.

This study focused on operations involving integers and rational numbers, which are fundamental concepts in Grade 7 Mathematics.

METHODOLOGY

Type of Research

This study used a quasi-experimental two-group design. The control group took the pretest and posttest without using the "Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)" intervention, while the experimental group used the intervention. Based on the study of Tella and Fatoki (2021) utilized a pretest-posttest control group design to assess the effectiveness of a game based instructional strategy on pupils' mathematics achievement in Nigeria.

Respondents

The researchers conducted this quasi-experimental study among Grade 7 learners of Mount Carmel College of Casiguran, Inc. for the School Year 2024–2025. The Grade 7 level consisted of two sections with a total of 78 students.

However, only students with parental consent were included in the study, in accordance with ethical standards. This resulted in 26 students participating in the experimental group, selected through purposive sampling based on the availability of consent.

To ensure a balanced comparison, matched purposive sampling was used to select 26 students for the control group. These students were chosen based on similar characteristics such as age, gender, and academic performance. Ethical considerations, including confidentiality, voluntary participation, and informed consent, were strictly observed throughout the research process.

The researchers chose Grade 7 students as respondents because this level marks a significant transition from elementary to high school. It is a critical stage where learners need to strengthen their foundational skills, particularly in Mathematics. The study aimed to help students improve their understanding of integers and rational numbers, which are essential for mastering more complex mathematical concepts in higher grade levels.

Sampling Method

This study included selected Grade 7 students at Mount Carmel College of Casiguran, Inc. for the 2024–2025 school year. Purposive sampling was used to select the 26 students in the experimental group, as only those with parental consent were included. To ensure an equal number of respondents in both groups, matched purposive sampling was employed for the control group by selecting 26 students who were comparable in terms of academic performance. These students are in a critical stage of transition from elementary to high school, where developing proficiency in performing operations with integers and rational numbers is essential for understanding advanced mathematical concepts in higher grade levels.

Proposed Innovation/Strategy

The 2022 Programme for International Student Assessment (PISA) highlights a concerning trend for the Philippines, as it ranks among the bottom 10 out of 81 countries, particularly performing poorly in mathematics assessments. This decline in mathematical competency has persisted over the years, with previous PISA evaluations in 2018 also indicating below-average performance by Filipino students in mathematics. To address this pressing issue, we are introducing an intervention strategy known as MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics). This initiative aims to assist students who struggle with the four fundamental operations of mathematics: addition, subtraction, multiplication, and division.

The Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) is designed to enhance the skills of Grade 7 students at Mount Carmel College of Casiguran, Inc. by focusing on critical thinking and problem-solving within the context of rational numbers and integers. The game utilizes a modified Scrabble board where, instead of forming words, students create mathematical expressions and equations with integers and rational numbers. This unique approach not only reinforces mathematical concepts but also fosters a deeper understanding of rational numbers and integers.

The objectives of this mathematical model are clear: Students will learn the nature of rational numbers and integers, perform basic operations involving these numbers, create mathematical equations, and enhance their critical thinking skills by developing their expressions and equations. The materials for this interactive learning experience include a modified SCRABBLE board game, along with tiles designed for the mathematical equations.

The procedure for playing Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) begins with the teacher dividing the class into groups of four, each responsible for providing a game board and tiles. Players start by drawing tiles to determine the first turn order, and the player with the lowest value tile goes first. Each player is then given eight tiles to work with. The first player must create and place their equation or expression on the star square in the center of the board.

As the game progresses, players will replace their used tiles with new ones after each turn. They have the option to pass if they feel stuck with their current tiles. Scoring in MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) is based on the value of each tile and the strategic use of premium squares, which offer bonuses for players' equations and expressions. Players can also earn additional points through specific achievements, such as utilizing all eight tiles in one turn, known as "Bingo."

It is important to note that certain rules apply to the formation of expressions, such as the requirement for operations to separate every equation or expression and the restrictions on positioning tiles. Furthermore, players have the option to use blank tiles to serve as any number or value they desire.

In summary, MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) is a dynamic and engaging way to improve students' mathematical skills,

foster critical thinking, and provide an enjoyable learning experience. Through this modified game, Grade 7 students at Mount Carmel College of Casiguran, Inc. will not only enhance their proficiency in mathematical operations but also develop vital problem-solving skills that will serve them well in their academic pursuits.

Instrument/s

The research instruments used in this study include the following:

Pretest/Posttest. The researchers developed a 30-item test, which was reviewed and validated by the panel experts. It was given to both the control and experimental groups after the intervention. According to a publication in Prehospital and Disaster Medicine, pretest-posttest designs are a form of quasi-experimental research that allow for straightforward assessment of an intervention applied to a group of study participants.

Data Collection Procedure

In this quasi-experimental study, data will be collected through structured assessments to ensure a comprehensive understanding of the objective of the study.

Firstly, a pre-test assessment will be administered to the control group in gathering the baseline data, followed by classroom observations to document real-time interactions and capabilities of the Grade 7 learners.

After the implementation of the intervention strategy, structured assessment such post-test will be conducted to evaluate changes in the skills of students in terms of the solving fundamental operations of integers and rational numbers. Ensuring a systematic, efficient and reliable analysis on the findings of the study.

Ethical Considerations

The study involved 78 Grade 7 students from Mount Carmel College of Casiguran, INC., divided into two sections. The experimental group had 26 students from St. Elisha, while the control group had 26 students from St. Elijah.

The researchers followed ethical guidelines, ensuring honesty, proper referencing, confidentiality, and objectivity in reporting findings. Plagiarism was strictly avoided. Respondents were informed about these ethical considerations, and consent was obtained from their parents. They also confirmed their voluntary participation through a signed waiver. The study prioritized the safety and well-being of all participants. The researcher ensures the information gathered during the process.

Data Analysis

To assess the academic performance of Grade 7 learners in Mathematics, both pre-test and post-test scores were collected from the control and experimental groups. The mean scores were computed to determine the learners' performance levels before and after the intervention.

To analyze the data, two types of t-tests were utilized through IBM SPSS software:

- A dependent (paired sample) t-test was used to compare the pre-test and post-test scores within the experimental group, measuring the effect of the Math SCRABBLE intervention.
- An independent t-test was applied to compare the post-test scores between the control and experimental groups, assessing the relative effectiveness of the intervention against traditional instruction.
- A Cohen's d was also administered in the study to measure the effect size between the two means of the Experimental and Control groups.

These statistical tests were conducted to identify whether the observed differences in mean scores were statistically significant. The p-value obtained from the tests served as the basis for determining significance at the 0.05 level.

The methodology is supported by recent studies. Segarino (2024) applied pre-test and post-test t-test analysis to evaluate numeracy intervention among Grade 3 learners, reporting significant improvements. Likewise, Malipot, Cayabyab, and Tumambing (2023) used a similar approach to measure the effectiveness of Vedic Math strategies with Grade 2 students, also reporting positive outcomes. These references reinforce the validity of using mean scores and t-tests to evaluate instructional interventions in Mathematics.

Plan for Dissemination and Utilization

The proponents plan to publish the research findings in local publications, such as local newsletters and student

research journals, to make the study accessible to the academic community.

The researchers also intend to share the results through online platforms, including academic forums and research-related social media groups, where fellow students and educators can use the study as a reference.

Additionally, the proponents aim to present the findings during research forums, student organization meetings, and class discussions. This will provide an opportunity for peers and faculty members to engage with the study and explore its applications.

Lastly, the researchers aim to share the study with relevant institutions or organizations that may find the results useful for further research or practical implementation.

RESULTS AND DISCUSSIONS

This part of the study presents the result and discussion of the data gathered through textual and tabular forms to answer the stated problems and hypothesis in part I of the study.

1. Level of Academic Performance of Grade 7 Students in the Control and Experimental Groups Before the Intervention

Table 2 presents the level of academic performance of Grade 7 learners in Mathematics before the study was conducted, as measured by their mean scores. The results show that the mean pretest scores of the experimental and control groups were 12.154 and 12.308, respectively. This indicates that both groups did not meet the Minimum Proficiency Level (60% passing rate) set by the Department of Education in answering questions related to operations on integers and rational numbers.

Table 2: Academic Performance of Grade 7 Learners Before the Conduct of Intervention

	N	Mean	Descriptive Rating
Experimental	26	12.154	Did Not Meet the Expectation
Control	26	12.308	Did Not Meet the Expectation

These findings imply that both groups needed an intervention to enhance their skills in performing operations on integers and rational numbers, which serve as prerequisite skills for higher-level Mathematics lessons. This is supported by Carinugan (2022), who emphasized that many students enter higher levels with gaps in fundamental operations, particularly with integers, affecting their ability to grasp advanced topics. This observation is consistent with the findings of Kültür and Kutlu (2021), who emphasized that establishing comparable pre-test scores between groups is crucial for accurately measuring the effects of an educational intervention. Similarly, Reyes and Camacho (2018) underscored the importance of pre-test comparability in quasi-experimental designs, noting that balanced starting

points are essential to assess the true impact of instructional strategies. In addition, Lerma and Salazar (2020) found that when experimental and control groups exhibit similar baseline scores, the effects of the intervention are more reliably attributed to the treatment rather than confounding variables.

2. Level of Academic Performance of Grade 7 learners under the Control and Experimental Groups After the Intervention

Table 3 shows the level of academic performance of Grade 7 learners in both the control and experimental groups after the intervention. The experimental group got a mean post-test score of 20.231, while the control group got a mean of 12.846. This means that, on average, students in the

experimental group were able to answer around 20 out of the 30 test items, showing a strong grasp of the lesson after the intervention. On the other hand, the control group answered only about 13 items, which suggests that many of them may have struggled with the concepts. The big gap between the two mean scores—more than 7 points—shows a clear difference in how each group performed after the

intervention. The experimental group's high mean score reflects a much better understanding of the lesson compared to the control group, whose average score stayed close to their pre-test level. This difference in results shows how learners may respond more positively to engaging or innovative teaching strategies.

Table 3: Academic Performance of Grade 7 Learners After the Conduct of Intervention

	N	Mean	Descriptive Rating
Experimental	26	20.231	Outstanding
Control	26	12.846	Did Not Meet the Expectation

This implies that the experimental group, which was exposed to the intervention “Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics),” performed better than the control group. Furthermore, the results suggest that the intervention was proven effective in enhancing learners' performance in operations on integers and rational numbers. Recent studies support the effectiveness of game-based learning in improving students' mathematical skills and motivation. For instance, a 2023 study found that game-based learning positively impacts students' knowledge and mathematical abilities, enhancing both their cognitive and affective domains (Frontiers in Psychology, 2023). Similarly, research indicates that educational games help develop problem-solving skills and encourage self-learning, leading to a better understanding of mathematical concepts (ResearchGate, 2023). These findings reinforce the effectiveness of interventions like “Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)” in improving learners' mathematical performance. This is supported by Cruz and Martinez (2019), who found that

learners exposed to interactive learning tools showed much higher post-test scores compared to those taught with traditional methods. Bautista and Ramos (2020) also reported that the use of game-based strategies significantly improved post-test performance in mathematics among Grade 7 learners. Similarly, Delos Reyes and Javier (2021) emphasized that educational interventions that involve active participation tend to result in better academic outcomes in math subjects.

3. Significant difference in the academic performance of the learners under the two groups after the intervention.

Table 5 revealed a significant difference in the academic performance of learners in the control and experimental groups after the intervention. The computed t-statistic of 8.836 was greater than the critical value of 2.009 at the 0.05 level of significance. This analysis provides evidence to reject the null hypothesis. Thus, there is a significant difference between the academic performance of the experimental group and the control group following the implementation of the intervention. Additionally, using IBM SPSS software to calculate Cohen's d yielded a result of 2.443, which falls under the “very large” effect size, indicating a substantial difference between the posttest of the experimental and control group.

Table 5: Difference In the Academic Performance of The Learners Under the Control and Experimental Group After the Conduct of Intervention.

	N	Mean	SD	T-Stat	P-Value (0.05)
Experimental	26	20.231	1.928	8.836	2.009
Control	26	12.846	3.708		

This implies that using “Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)” can significantly affect learners' academic performance by enhancing their skills in operations involving

integers and rational numbers. The results suggest that learners were motivated and enjoyed performing operations due to the game-based strategy. Many students found the activity entertaining and were eager to win rewards, which increased their engagement and participation.

These findings are supported by recent studies highlighting the effectiveness of game-based learning in mathematics. Chee et al. (2021) found that digital games significantly improved students' understanding of rational numbers, while Morales and Cabansag (2020) concluded that game-based learning positively impacts students' academic performance and attitude toward mathematics. A review by Tsai, Yu, and Hwang (2021) also confirmed that such strategies enhance cognitive skills and motivation. These studies reinforce that incorporating games like "Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)" in teaching operations with integers and rational numbers can be a highly effective approach in improving learners' mathematical performance.

4. Significant difference in the academic performance of the learners under the

Table 6: Significant difference in the academic performance of the learners under the experimental group between pre-test and post-test results.

Experimental	N	Mean	SD	T-Stat	P-Value (0.05)
Pre-test	26	12.154	3.146	-30.086	±2.060
Post-test	26	20.231	1.928		

This finding aligns with the results of Pascua and Tamse (2020), who found that the use of board games significantly enhanced the performance of Grade 7 students in learning integers. Similarly, Alcantara and Dela Cruz (2019) highlighted that a game-based learning approach resulted in higher engagement and achievement in Mathematics among Grade 7 students. Villanueva and Santos (2021) also emphasized that interactive games helped improve problem-solving and critical thinking skills in the same grade level. These studies support the effectiveness of Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) as a tool for fostering meaningful learning and academic growth in mathematics.

CONCLUSION

In the light of the above results of the study, the following conclusion were drawn:

1. Before the conduct of intervention, the academic performance of both experimental group and control group did not meet the expectation in answering the questions in operations on integers and rational numbers.
2. After the conduct of intervention, the experimental group attained a high level of proficiency while the control group did not meet the expectation. It was

experimental group between pre-test and post-test results.

Table 7 shows that there is a significant difference in the academic performance of the learners in the experimental group before and after the intervention, based on the results of the dependent t-test. The computed t-statistic for the pre-test and post-test scores of the experimental group is -30.602, which is far beyond the critical value of ± 2.060 at the 0.05 level of significance. This indicates that the difference in scores is statistically significant. Since the absolute value of the computed t-statistic (30.602) is greater than the tabulated t-value (2.060), we reject the null hypothesis. Therefore, there is sufficient evidence to conclude that the Math SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) intervention significantly improved the academic performance of Grade 7 learners in Mathematics.

proven that "MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)" was effective in enhancing the learner's performance on operations on integers and rational numbers.

3. After the conduct of intervention, the academic performance of the experimental group and control group have significant differences. This proves the effectiveness of "MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)" game as intervention in enhancing the performance of Grade 7 learners on operations on integers and rational numbers.
4. After the intervention, the result of the pretest and posttest of the experimental group shows a significant difference. The pretest results shows that Grade 7 learners did not meet the expectation, however after taking the intervention "MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics)",

the result of the posttest of the Grade 7 learner shows that they have attained a high level of proficiency. This proves that the intervention is effective for Grade 7 learners in enhancing their performance on solving operations on integers and rational numbers.

RECOMMENDATIONS

Based on the findings and conclusions derived, the following recommendations are offered:

1. MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) game strategy can be used by teachers in enhancing the performance of Grade 7 learners on operation on integers and rational numbers because it was proven effective.
2. The intervention strategy may also be used by the parents to teach their children on operations on integers and rational numbers at home. This is also may serve as their bonding, and quality time.
3. MATH SCRABBLE (Strengthening Critical Thinking and Problem-Solving, Reinforcing Rational Numbers and Integers, Applying Basic Operations for Building Learner's Excellence in Mathematics) may also be used as one of the activities in school during Mathematics Day Celebration to encourage more learner's participation on the said event.
4. The other researchers may adopt the result of this study to conduct similar study or approaches that will help to the learners to improve their academic performances especially on basic integers and rational numbers.

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