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The Use of Math Bingo in Improving Multiplication and Division Skills of Grade III Pupils

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Abstract: This study investigated the effectiveness of *Math Bingo* in improving the multiplication and division skills of Grade III pupils. The main goal was to determine whether the use of *Math Bingo* could enhance learners' computational performance. A classroom-based action research using a pre-test and post-test design was employed. Three teachers and 100 Grade III pupils from Ilwas Elementary School Subic , Zambales participated. Data were collected through tests and interviews, analyzed using descriptive statistics and a t-test for quantitative data, and thematic analysis for qualitative responses. Results showed a significant increase in pupils' post-test scores, improving from satisfactory to very satisfactory levels in both multiplication and division. Teachers reported that *Math Bingo* increased engagement and understanding during lessons. The study concluded that *Math Bingo* is an effective and enjoyable tool for improving mathematical skills among Grade III pupils.

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I. INTRODUCTION

➢ *Background of the Study*

Worldwide, many learners struggle with basic arithmetic operations such as multiplication and division. According to international assessments like TIMSS (Trends in International Mathematics and Science Study), a significant number of Grade 4 pupils fall below the proficiency benchmark in mathematics. This indicates a global need for innovative and engaging strategies—such as game-based learning—to strengthen foundational math skills.

According to Mutla (2025), Mathematics education forms the cornerstone of academic development, providing students with essential skills for navigating various real-world challenges. However, the journey to mathematical proficiency is often burdened with different obstacles. Primary-level students encounter unique challenges impacting their grasp of these fundamental mathematical concepts. One example is the students' difficulty understanding rational numbers, which hinders their academic achievement and mathematical growth. Rational numbers are integral to mathematics education, facilitating comprehension of mathematical concepts and their practical applications. Reyes et al. (2019) examined rational number learning in Philippine primary schools, revealing pervasive obstacles hindering students' mathematical development. Proficiency in performing operations with rational numbers and applying this knowledge in mathematical and real-world problem-solving contexts is essential in Mathematics education. Meanwhile, the Organization for Economic Cooperation and Development (OECD) reported that socio-economically advantaged Filipino students (top 25%) outperformed their disadvantaged counterparts (bottom 25%) by 36 score points in mathematics the average gap of 93 score points between these groups, it still indicates a notable disparity. Interestingly, 12% of disadvantaged Filipino students demonstrated academic resilience, scoring in the top quarter of mathematics performance, slightly exceeding the OECD average of 10%. This is much truer in the 2019 Trends in International Mathematics and Science Study (TIMSS) conducted by the International Association for the Evaluation of Educational Achievement, where they reported that the Philippines scored 297 in Math and 249 in Science (Mullis et al., 2019).

The Philippine education system continues to face challenges in mathematics proficiency, as reflected in NAP (National Achievement Test) and PISA (Programme for International Student Assessment) results. Many Grade School pupils find it difficult to master basic operations, showing a gap in conceptual understanding and computational fluency. The Department of Education emphasizes the need for interactive and learner-centered

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approaches to make math learning more effective and enjoyable. Hence, the teachers are doing their best to deliver all the lessons indicated in the curriculum guide in a way of discovering new materials and applying new ideas to improve their lessons. In several schools in Subic, Zambales, teachers report that many pupils struggle with multiplication and division despite repeated drills. Traditional teaching methods often fail to sustain learners' interest and retention. This situation calls for innovative classroom interventions like Math Bingo, which can make practice engaging and help pupils develop mastery through play-based learning.

II. LITERATURE REVIEW

Multiplication is a special and valuable operation used in everyday life. It may be learned through practice that leads to mastery of the multiplication table but learners nowadays do not just focus their time memorizing. Likewise, division is one of the four basic operations of arithmetic. Educators know that division of two natural numbers is the process of calculating the number of times one number is contained within another. They teach pupils that division is the inverse of multiplication. But not all pupils show mastery skills in solving division sentences unless with the help of fellow educators. Sandals (2016) stated that there are no silver bullets in math education and the memorization of multiplication tables alone will not solve all of the problems learners face. Shortcuts in math are only effective when they know how to take the long way; learning multiplication is no exception. The curriculum document does not explicitly state the memorization of multiplication tables as an expectation, but it does require that concepts be delivered using a variety of strategies and tools/manipulative. Where the problem may lie is how the curriculum expectations around multiplication are interpreted by the teacher. Hence, the study of Sandals implies that educators should use different strategies and instructional materials in delivering their lessons in Mathematics. They should not use a single tool or strategy to reach the goals and objectives of the new curriculum in Mathe-matics .According to Obut V.G. et al, (2023), the Mathematics Assessment of the Programme for International Student Assessment (PISA) indicated that more than half of Filipino children performed poorly, with scores below the lowest proficiency level. As indicated, the Philippines ranks second lowest among the 79 participating countries in Mathematics literacy. The commonality of Math makes it a requirement for higher education (Hwang et al., 2021). Making Mathematics easy for students is one of a teacher's most difficult challenges. Since Mathematics is taught at a higher level in higher education than in secondary and elementary schools, increasing numbers of students struggle with it in higher education. Hence, the causes that contribute to these students' struggles in learning Mathematics are the three themes: the teacher's delivery of instruction, learners' abilities and experiences, and the school environment and facilities for learning (Langoban, 2020). Elements, including students' attitudes toward the subject, teachers' teaching strategies, and the learning environment at school, influence how well children learn and succeed in Mathematics (Mazana et al., 2019).

Hence, the study of Obut and Sandals signify that educators should use different strategies in teaching and instructional materials in delivering their lessons in Mathematics. They should not use or focus on a single tool or strategy to reach the goals and objectives of the new curriculum in Mathematics .Teachers and even department heads or supervisors need extra time, effort and extraordinary ways in developing the skills of the pupils in multiplication and division. Educators need to be more creative and innovative in making the pupils enjoy Mathematics while developing the needed skills to be learned. Teaching them how to count or introducing multiplication and division skills without any material that would capture their interest is a challenge to the mentors. Improving the said skills is necessary to help lead pupils to better and greater well-being for them to cope up with the environment and experience less stressful lives. Based on observations, learners nowadays find Mathematics "boring" because of the perception that the subject is difficult and unpleasant and it seems like it is draining their minds.

Innovative educators know that learning Mathematics does not have to be boring for the pupils. They can guide pupils in improving skills while bringing fun and enjoyment on their part. When teachers and learners love what we they are doing, they will reach their goals to be successful.

- *Study Rationale*

The study will be significant to the following people. For the School Administrators, the study will help them plan interventions and programs to fit the needs especially of pupils with poor multiplication and division skills. For the teachers they may find and realize that the result of this study may help them initiate this material or tool in teaching to encourage others to improve the multiplication and division skills of their pupils. This study will also help the learners develop their multiplication and division skills without boredom. The use of Math Bingo may motivate them to study harder. Parents will benefit by their active participation in supporting their child and follow up teaching in their homes using Math Bingo.

To the Curriculum Developer, this would be of great help for them knowing that integrating the use of instructional games as a teaching strategy may help uplift the performance of pupils academically.

- *Purpose of the Research*

The main focus of this study was to determine the effectiveness of using Math Bingo as an innovative learning game in enhancing the Multiplication and division skills of Grade III pupils at Ilwas Elementary School. The research aims to explore how this engaging and interactive approach can help improve pupils' mathematical proficiency or skills, particularly in basic operations that often present challenges at the elementary level.

Specifically, the study aimed to assess the pupils' level of multiplication and division skills before the introduction of Math Bingo, serving as a baseline for comparison of skills or level. It also sought to describe how Math Bingo was applied

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during the teaching-learning process, detailing the procedures and strategies used in integrating the game into classroom instruction. Furthermore, the study examined the pupils' performance after the implementation of Math Bingo to determine any improvements in their mathematical abilities.

Finally, the research aimed to determine whether there was a significant difference in the pupils' multiplication and division skills before and after using Math Bingo. Through this, the study hoped to establish the effectiveness of the game as a supplementary instructional tool in developing essential computational skills among Grade III learners.

III. METHODOLOGY

➢ *Research Design*

The study utilized a classroom-based action research design that focused on measuring the multiplication and division skills of the pupil respondents before and after the implementation of the intervention. This design allowed the researcher to observe the direct impact of using Math Bingo as a teaching strategy within the actual classroom setting.

The research followed the experimental pattern O_1 X O_2, where O_1 represented the pre-test administered to the pupils to determine their initial level of multiplication and division skills. The symbol X denoted the treatment or intervention, which in this study was the use of Math Bingo as an innovative instructional game to enhance learning. Finally, O_2 referred to the post-test, which was conducted after the intervention to evaluate any improvement in the pupils' mathematical performance.

Through this design, the study was able to compare the pupils' performance before and after the use of Math Bingo, providing a clear basis for determining its effectiveness in improving multiplication and division skills.

➢ *Instruments*

The following instruments were used to gather the data needed for the analysis of the study: Teacher-made pre-test/post-test, Math Bingo and Interview Guide. The study used a teacher-made pre-test and post-test. The multiple choice test was comprised of 20 items for multiplication and 20 items for division (Appendix G) which were designed following the table of specification (Appendix F) to measure the skills of the pupils in Grade III. All the skills were based on the Curriculum Guide (Appendix B) for the Second Grading Period. The topics included in Part 1 of the test are: (a) multiplication of numbers 1 to 10 by 6, 7, 8 (b) multiplying 2 to 3 digit numbers with and without regrouping, (c) multiplying 2 to 3 digit numbers with multiples of 10 to 100, 1000, (d) estimating products, and (e) solving word problems involving multiplication. Part II is about division of numbers up to 100 by 6, 7, 8, 9 with and without remainder with problem solving included.

The test was validated by the School Math Coordinator using the scoring rubrics (Appendix J) for comments and suggestions. The comments were considered seriously in the improvement of the first draft. To test the reliability and validity of the test, pilot testing was conducted among 10 Grade III pupils of Aningway Sacatihan Elementary School who were not part of the respondents of the study to identify problems in the final administration of the test. This was done for the purpose of determining whether the respondents clearly understood all items in the test question. Questions that were found irrelevant were removed or changed. Those questions that were found vague were modified and improved. The items that were not within the range of 0.20 to 0.80 difficulty and 0.30 to 0.80 discrimination index were discarded and items that fell within the limit were retained. The computed correlation for the odd and even items in multiplication is r = 0.88 with Spearman Brown reliability coefficient of 0.94. In division, r = 0.54 with reliability coefficient of 0.70. Finally after presenting the revised instrument to the adviser, the researcher requested permission of the Schools Division Superintendent for official endorsement of the study to the school respondents.

Math Bingo was used as a material in teaching the lessons. The researcher made the Bingo Cards with equations and distributed them to the three teachers. The materials needed in using Math Bingo are the following: Bingo card for each player, 25 Bingo equation cards, about 25 markers for each player (can use coins or bingo chips etc. or ask pupils to bring markers and to keep the markers in their bags until the teacher asks them to do so). The steps in the preparation for Math Bingo are: (a) Print the bingo cards and equation cards, (b) Cut out the equation cards as well as each of the bingo card (The teacher may change the equation cards according to the lesson), (c) Prepare the markers to be used, (d) Announce the possible prize of the winner (either in cash or in kind, giving them appraisals – barangay clap, Dionisia clap very good clap, etc.)

For further understanding about Math Bingo, these are the steps in playing: (a) Randomly give each pupil a bingo card, (b) Let them bring out their 25 markers, (c) The caller/teacher announces whatever design/pattern she wants to be the winner of the game. It can be diagonal, straight line (under what letter), horizontal, etc. She or he picks and reads off one question at a time, (d) The pupils will solve the multiplication or division sentence on one whole sheet of paper. If their answer matches one of the numbers on their cards they should put their markers on it. The number should be under the right letter announced by the teacher, and (e) Play continues until someone has placed 5 markers across a row of their card or across, a diagonal or horizontal. The player who marks off one of these patterns shall shout the magic word BINGO. The teacher will check his/her answers and if all the answers one correct he/she will be declared as winner of the game. The teacher will ask the winner to go in front of the class to be recognized and receive her or his award,

Another instrument is the interview guide (Appendix H). This consists of the profile of the respondents and four questions for the pupils while seven questions for the teachers conducted at the end of the second grading period. This instrument was used to determine how Math Bingo was applied in the lessons. The teachers were asked to describe

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Math Bingo as an intervention material in teaching multiplication and division skills, why do they think Math Bingo really helps in improving the multiplication and division skills of the pupils, what part of the lesson did they usually apply the Math Bingo? And how many minutes did they let their pupils play Math Bingo. They were also asked about the pupils' discipline and observations on how the pupils played the game. Meanwhile, the pupils were also interviewed about their enjoyment, responses on the effectiveness of Math Bingo, part of the lesson where their teacher let them play, and how did they apply the learned skills in their everyday life.

➢ *Participants*

Three sections were selected from Ilwas Elementary School Subic, Zambales through non-random sampling, specifically the convenience sampling technique. The selection of the participants was based on the accessibility of the researcher. All Grade III regular pupils enrolled during SY 2024-2025 in the school were selected as the respondents of the study. Three sections were Grade Three Beryl with 30 learners, Grade three Ruby with 31 learners and Grade The Amethyst with 39 learners. Ilwas Elementary School is located in Barangay Ilwas Subic, Zambales.

➢ *Data Collection*

Upon the approval of the Request to Conduct the study (Appendix A), the researcher visited the schools and asked for the schedule of administration of the test. The pretest was conducted on August 29, 2024. Result of the test was analyzed to help the teachers know how to help their pupils. Least learned skills were determined (Appendix M). The Grade III pupils were exposed to the use of Math Bingo (Appendix C and D) as intervention material in Mathematics for the second grading period. The teachers alternately used Math Bingo as instructional material in their lessons. Every afternoon from 1:00 to 1:30 during their pre-session in afternoon, pupils were playing the game with the guidance of their teachers or assigned advisers. Observation was also done to document how the teachers used the material. Post-test was administered on November 8, 2024. Answer sheets were retrieved and checked. The scores were tallied and interpreted by the researcher to test for the significant differences between their mean scores in the pre-test and post-test. Interview was conducted at the end of the second grading to know how Math Bingo was applied in each lesson. All the responses were analyzed by the researcher.

➢ *Using Math Bingo in Improving Grade III Pupils' Multiplication and Division Skills*

The study was conducted during the Second Grading period. The lessons taught during this quarter focused on Numbers and Number Sense about multiplication and division.(Appendix B)

Pre-test (Appendix G) was administered to analyze the prior level of multiplication and division skills of the Grade III pupils. The test is composed of questions and equations about the second grading period which is about multiplication and division. 20 items for multiplication and 20 items for division.

Least Learned Skills or Competencies. The least learned skills or competencies (Appendix K) were identified and made by the teacher or adviser as a guide in identifying topics to focus in helping the pupils during the intervention period. In multiplication, the common least learned objectives or competencies among the three groups are multiplying 2-digit numbers by 2-digit numbers with regrouping and using the commutative property of multiplication. Whereas in division, the common least learned skill of the three groups is solving word problem using division of 2-4 digit numbers by 1-2 digit numbers. Based on these findings, an intervention material which is the Math Bingo was used to help improve the pupil's skills in multiplication and division.

- *Preparation and Use of Math Bingo.*

The intervention material Math Bingo (Appendix C and D) was designed and planned to help improve the skills of the Grade III pupils in multiplication and division especially the least learned. The performance of pupils should be in proficiency level of 75% and above. This should be met to consider a class improved or well-skilled. Math Bingo was designed to increase and develop the pupils' thinking and computation skills while enjoying. Personalized bingo cards were made in order for the questions to be appropriate for each lesson. The researcher provided the materials and gave them to the advisers of the respondents to be used during the second grading period alternately or on their pre-session activities. The instructional materials were meant to help pupils in improving their skills.

During the application of Math Bingo, bingo cards are personally designed by the researcher as well as markers and mathematics equations that are appropriate to the lessons were used. The winner received a reward depending on what their teacher had announced before playing.

➢ *Data Analysis and Framework*

Development of the different skills in Mathematics is a passport towards becoming an excellent learner. Especially in the new curriculum, pupils should be guided and well nurtured with knowledge imparted by the mentors. Topics should be mastered using an instructional material that would encourage them to learn eagerly. The conceptual framework of the study is shown in Figure 1.

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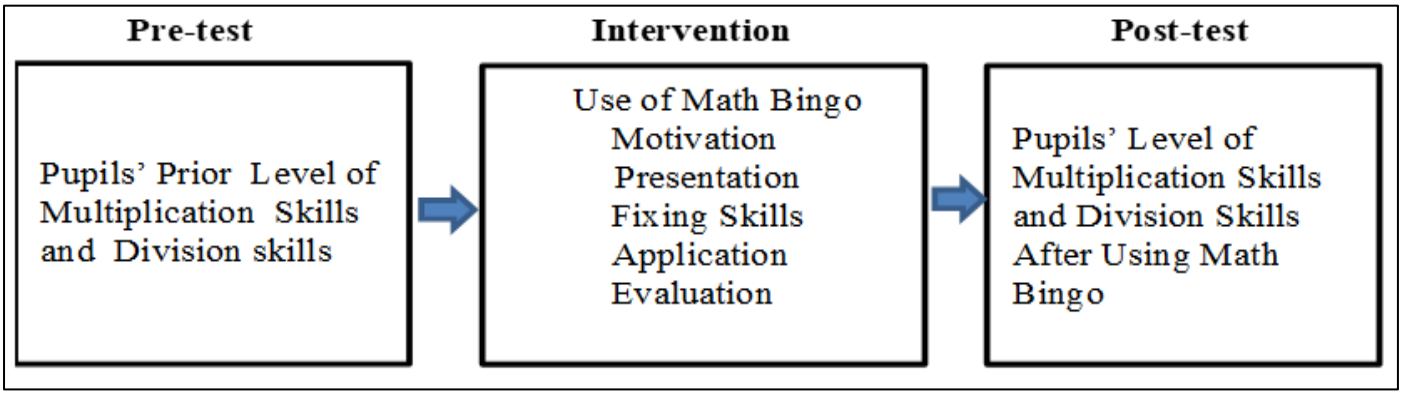

Fig 1 Conceptual Paradigm of the Study

The conceptual paradigm shows that the study was conducted to determine the effectiveness of using Math Bingo as an intervention material that may help in increasing the level of multiplication and division skills of the Grade III Pupils. The researcher observed the elements of how the teacher used the innovative game in the motivation, lesson presentation, fixing skills, application and evaluation. A pre-test and a post-test had been used to assess the multiplication and division skills of the pupils before and after the intervention.

The results of pre-test and post-test were analyzed and interpreted using the following statistical tools: frequency Counts and percentage, weighted mean and t-test. Frequency counts and percentage was used to gain information on the number of respondents and their pre-test and post-test scores. A weighted mean is a kind of average. Instead of each data point contributing equally to the final mean, some data points contribute more "weight" than others. Each data value has a weight assigned to it. Data values with larger weights contribute more to the weighted mean and data values with smaller weight contribute less to the weighted mean. In this study weighted mean was used to determine the level of multiplication and division skills of the pupils before and after the use of Math Bingo. T-test was used in this study to determine the significant differences in the multiplication skills as well as the division skills of the Grade III pupils before and after the use of Math Bingo.

Table 1 The interpretation of the multiplication and division skills of pupils is as follows:

Table 1 Conceptual Paradigm of the Study

Scores	Verbal Description
17-20	Excellent
13-16	Very Satisfactory
9-12	Satisfactory
5-8	Fairly Satisfactory
1-4	Poo

IV. RESULTS AND DISCUSSION

This chapter includes the presentation, analysis and interpretation of the results of the study. Gathered data are presented in tables to facilitate understanding by showing evidences for the answers to the problems stated in Chapter 1. The three sections were coded as S1, S2 and S3 for ethical consideration

Table 2 Distribution of Pupils' Pre-Test Scores in Multiplication and Division

Pre-test Scores Results in Multiplication								
Scores	**S1**		**S2**		**S3**		**TOTAL**	
	F (N=39)	**%**	**F (N=30)**	**%**	**F (N=31)**	**%**	**F (N=100)**	**%**
17-20	2	5.13	3	10.00	0	0.00	5	5.00
13-16	11	28.21	13	43.33	10	32.26	34	34.00
9-12	22	56.41	14	46.67	18	58.06	54	54.00
5-8	4	10.26	0	0.00	3	9.68	7	7.00
Mean	**11.51**		**12.70**		**11.29**		**11.80**	
Pre-test Scores Results in Division								
Scores	**ES1**		**ES2**		**ES3**		**TOTAL**	
	F (N=39)	**%**	**F (N=30)**	**%**	**F (N=31)**	**%**	**F (N=100)**	**%**
17-20	0	0.00	0	0.00	0	0.00	0	0.00

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13-16	10	25.64	8	26.67	4	12.90	22	22.00
9-12	11	28.21	19	63.33	17	54.84	47	47.00
5-8	16	41.03	3	10.00	10	32.26	29	29.00
1-4	2	5.13	0	0.00	0	0.00	2	2.00
Mean	**9.64**		**11.17**		**9.17**		**10.14**	

Legend: 17-20 (Excellent), 13-16(Very Satisfactory), 9-12(Satisfactory), 5-8 (Fairly Satisfactory), 1-4 (Poor)

➢ *Multiplication Skill*

Table 2 shows that the Grade III pupils typically obtained Satisfactory Scores in terms of multiplication skills. Majority of the pupils in S1 fell into the bracket score of 9-12 with 22 pupils or 56.41% while the lowest number of pupils which is 2 or 5.13% are under the bracket of 17-20. In S2, the highest number of pupils which is 14 or 46.67% are on the bracket of 9-12 while the lowest number of pupils are in the bracket 0f 17-20 which is 3 or 10% . S3 also got a majority of 18 or 58.06% of pupils which in the bracket of 9-12.

As gleaned on the table, S1 got the weighted mean of 11.51 (sd=2.69), S2 with 12.70 (sd=2.00) and S3 with 11.29 (sd = 2.41). This shows that among the three sections S2 got the highest weighted mean. A majority of the test scores of the pupils fell under 9-12 bracket of the 20-item test in multiplication. Fifty-four out of 100 or 54% of the pupils were on satisfactory level while 7 pupils had scores of 5-8 with fairly satisfactory level. While five pupils got excellent scores. Overall, the mean of the three groups was 11.80 (sd=2.47), indicating that the pupils' prior skills in multiplication were generally satisfactory.

➢ *Division Skill*

Meanwhile, that the typical skills in division of the pupils somehow vary in the three sections from fairly satisfactory to very satisfactory level. 16 pupils or 41.03% from S1 are under 5-8 bracket which is in fairly satisfactory level while 2 or 5.13% had scores of 1-4 with poor level of division skills. S2 had a greater number of the test scores of the pupils under 9-12 bracket or satisfactory level with 19 or 63.33% and the lowest number of pupils were under the 5-8 which is 3 or 10%. As reflected in the table, in S3 majority of scores dropped in bracket 9-12 with 17 or 54.84% pupils and 4 pupils or 12.90% are in very satisfactory level.

As seen on the table, S1 got the weighted mean of 9.64 (sd=3.37), S2 acquired 11.17 (sd = 2.34) and S3 obtained 9.77 (sd = 2.70). The result reflected that S2 had the highest mean among the three sections. For the total result of division post-test, 47 or 47% of the pupils were within bracket 9-12 while 2% were in poor level. The total weighted mean for the three sections mean was 10.14 (sd = 2.94) which also indicates that the pupils' prior knowledge in division were generally satisfactory.

Table 3 Teachers' Responses on How Math Bingo was Applied

Questions	**ST1**	**ST2**	**ST3**
Q1	It helps the pupils in mastering multiplication and division skills	Math Bingo is a material that can enhance my pupils' multiplication and division skills	Math Bingo is an indispensible tool in teaching multiplication and division
Q2	Yes because it develops their skills	Yes because as my pupils are learning they are enjoying too	Yes this game offers enjoyment to the pupils while learning
Q3	Application	Motivation, application or fixing skills	Motivation
Q4	5-10 minutes	10-20 minutes	20-30 minutes
Q5	Yes so that they can hear the equation	Yes, because they need to listen carefully for them to hear the equation	Yes because when pupils are disciplined classroom instruction can be done clearly
Q6	Individually	Individually	The pupils play Math Bingo by group, by pairs or individually
Q7	Yes because for them playing Math Bingo is enjoyable	Yes because pupils enjoy playing games and they keep on requesting when to play Math Bingo	Yes because I've seen them playing Math Bingo during their free time.

The three teachers were also asked by the researcher how they apply Math Bingo during fixing skills application and motivation. Section Teacher 1(ST1), ST2 and ST3 said that during motivation they let their pupils get their bingo cards and markers. They let their pupils answer two to three equations to motivate them. They continued the game in the part of Application, four to 25 equations until someone shouts "Bingo". During fixing skills they grouped their pupils. They played Math Bingo for 10-20 minutes. And sometimes they let their pupils play individually during evaluation for 20 minutes. The three teachers agreed that Math Bingo helped in improving the skills in multiplication and division of the pupils. ST2 has the most acceptable comment when she said that Math Bingo is a material that can enhance her pupils' multiplication and division skills while they are enjoying during motivation, application or fixing skills. And pupils really enjoyed Math Bingo in ST2 because they keep on requesting when to play the game.

Appendix I shows the frequency and percentage of pupils who were interviewed after using the intervention Math Bingo. First, they were asked if they enjoyed playing

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Math Bingo. In school S1, thirty-five or 89.74% responded yes and four said somewhat they enjoyed the game. Twenty-seven out of 30 pupils in S2 said yes, while thirty one or all pupils in S3 responded yes they enjoyed the game.

For question number two, a total of 86 out of 100 pupils or 86% responded that Math Bingo really helped in improving their thinking skills in multiplication and division. Thirty-one or 79.49% of the pupils in S1 responded that Math Bingo improves their skills in multiplication while 8 pupils said that Math Bingo somewhat helps them. In S2 28 out of 30 Pupils stated that Math Bingo improves their skills while 2 pupils said that Math Bingo makes them happy and it helps them in answering the tests.S2 learner said that he was eager to learn more how to multiply and divide because of Math Bingo. In S3, 27 or 87.10% of the pupils said that it improves their skills in multiplication and division skills while the four pupils said it just makes them happy. Eight pupils responded that Math Bingo somewhat helps them while six pupils said "no".

The Pupils were also asked what part of the lesson did their teacher let them play Math Bingo. In S1, 8 pupils responded that Math Bingo was played in motivation, 29 pupils said during the application and 2 during evaluation. Seven pupils in S2 said during motivation, 2 in motivation, 11 during application while 10 pupils said during evaluation. In S3, five pupils said that their teacher let them play Math Bingo during motivation, 13 pupils in application and 13 during evaluation. For the total, twenty pupils said part of motivation, two pupils said on presentation, 25 said on evaluation and a majority of 53 pupils said that Math Bingo was being played during the application.

Lastly, they were asked how did they apply the skills they learned in playing Math Bingo in their everyday life. In S1, 20 pupils used their skills in buying in the canteen, store or supermarket, 16 used it in counting money, 2 pupils said that they use their skills in dividing things or money and 1 pupil uses it in answering test. Eight pupils in S2 use it in buying in the canteen, store or supermarket, seven pupils use it in counting money, five in dividing things, five in answering tests and five pupils responded other things. While in S3, fourteen pupils use it for buying in the canteen, store or supermarket, eight use it in counting money or things, three use it in dividing things, one pupil said that she uses it in answering test and five pupils responded other things. All in all, forty-six pupils responded that they are using the skills they learned when they buy in the canteen, market or store and 31 of them responded that they utilize these skills as they count money and anything, ten pupils use it in dividing things or money, seven said they use their skills in answering test and ten pupils responded other things.

➢ *Multiplication and Division Skills of the Pupils after the Use of Math Bingo*

After the intervention period, the skills of the Grade three pupils in multiplication and division was determined and analyzed. Math Bingo was used by the three groups for the Second Grading period. Post-test was administered to determine the effect of the intervention to the performance of the pupils. Table 4 shows frequency and percentage distribution of pupils' scores in the post-test.

- *Multiplication Skill*

As gleaned in Table 3, the Grade III pupils typically obtained varied Scores in terms of multiplication skills. A majority of scores in S1 fell into the bracket score of 13-16 with 24 pupils or 61.54% while 5 or 12.82% were under the bracket of 9-12. In S2, bulk of scores were on the bracket of 17-20 which is excellent level while the lowest number of pupils are in the bracket 0f 13-16 which is 13 or 43.33% . S3 got 19 or 61.29% out of 31 pupils which in the bracket scores of 17-20. 38.71% or 12 pupils had their scores on th13-16 bracket. S1 got the weighted mean of 14.90 (sd=2.39), S2 with 16.83 (sd=1.74) andS3 with 17.00 (sd = 1.65). S3 got the highest weighted mean among the three section. Totally 49 or 49% of the pupils were under 13-16 bracket while 5 pupils had the scores of 9-12 and 46 or 46% fell on excellent level. The combined weighted mean of the three groups was 16.13 (sd=2.21), indicating that the pupils' skills in multiplication were generally very satisfactory after the use of Math Bingo.

Table 4 Distribution of Pupils' Post-Test Scores in Multiplication and Division

Post-test Scores Results in Multiplication								
Scores	**ES1**		**ES2**		**ES3**		**TOTAL**	
	F (N=39)	**%**	**F (N=30)**	**%**	**F (N=31)**	**%**	**F (N=100)**	**%**
17-20	10	25.64	17	56.67	19	61.29	46	46.00
13-16	24	61.54	13	43.33	12	38.71	49	49.00
9-12	5	12.82	0	0.00	0	0.00	5	5.00
Mean	**14.90**		**16.83**		**17.00**		**16.13**	
Post-test Scores Results in Division								
Scores	**ES1**		**ES2**		**ES3**		**TOTAL**	
	F (N=39)	**%**	**F (N=30)**	**%**	**F (N=31)**	**%**	**F (N=100)**	**%**
17-20	13	33.33	13	43.33	19	61.29	45	45.00
13-16	18	46.15	16	53.33	12	38.71	46	46.00
9-12	8	20.51	1	3.33	0	0.00	9	9.00
Mean	**14.69**		**16.03**		**16.16**		**15.55**	

Legend: 17-20 (Excellent), 13-16(Very Satisfactory), 9-12(Satisfactory), 5-8 (Fairly Satisfactory), 1-4 (Poor)

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- *Division Skill*

Meanwhile, the result of the post- test in division was shown also in Table 4. Eighteen or 46.15% of the 39 pupils of S1 got the scores between 13-16. Eight or 20.51% of them fell into 9-12 bracket. S2 got a majority of pupils under the scores of 13-16 while 1 pupil was in satisfactory level. As reflected in the table, 19 pupils or 61.29% of the pupils in S3 got the scores of 17-20 and 12 or 38.71% were under the bracket scores of 13-16.

For the total frequency and percentage, the bulk of scores fell into 13-16 bracket wherein there were 46 pupils or 46%. Under 9-12 bracket there were 9 pupils or 9%. S1 got the mean of 14.69 (sd=2.26), S2 garnered 16.03 (sd=1.73) and S3 had the highest performance in division with the mean of 16.16 (sd=1.59). The total performance of the pupils in division post-test had a weighted mean of 15.55 (sd=2.02) which indicates that the skills of the pupils in the three groups were all improved and they were generally in very satisfactory level.

➢ *Significant Difference in the Pupils' Skills*

The respondents of the study were given pre-test before the treatment and post- test after the treatment to determine if there is a significant difference in the multiplication and division skills of the pupils before and after the use of Math Bingo.

The result of the paired sample t-test for mean differences between pre-test and post-test scores in multiplication is shown in the table 4.

As shown in the table, S1 got a mean difference of 3.38 pre-test over post-test. T-test showed a t-value of 6.82 showing high significance as well as S2 with mean difference of 4.13 with a t-value of 11.25 and S3 had 5.71 mean difference and a t-value of 15.37. All the test results of the three schools denoted a high significance.

Table 5 Paired Sample T-Test for Mean Differences Between Pre-Test and Post-Test Scores in Multiplication

SECTION	TEST	MEAN	SD	MEAN DIFF	SD OF DIFF	T	DF	p-value	Effect Size
S1	Pre-test	11.51	2.69	3.38	3.10	6.82	38	4.34E-08 *	1.09
	Post-test	14.90	2.39						
S2	Pre-test	12.70	2.00	4.13	2.01	11.25	29	4.29 e-12 *	2.05
	Post-test	16.83	1.74						
S3	Pre-test	11.29	2.41	5.71	2.07	15.37	30	9.2E-16 *	2.76
	Post-test	17.00	1.65						
TOTAL	Pre-test	11.80	2.47	4.33	2.67	16.21	99	1.28E-29 *	1.63
	Post-test	16.13	2.21						

*Significant at 1% Level.

The overall pre-test mean was 11.80 (sd=2.47) and the post-test mean is 16.13 (sd=2.21) with mean difference of 4.33. The t-test revealed a t-value of 16.21 indicating high significance ($p < 0.01$) with considerable large effect size (1.632). This result implies that the skills of the Grade III pupils in multiplication improved after using Math Bingo.

In table 5, the result revealed that S1 had a mean difference of 5.05, with t-value of 9.31; S2 got mean difference of 4.87, and a t-value of 10.43; S3 garnered mean difference of 6.39 and a t-value of 19.35. The results of the t-test for each of the three schools were all highly significant.

Table 6 Paired Sample T-Test for Mean Differences between Pre-Test and Post-Test Scores in Division

School	TEST	MEAN	SD	M DIFF	SD OF DIFF	T	DF	p-value	Effect Size
S1	Pre-test	9.64	3.37	5.05	3.39	9.31	38	2.37E-11*	1.49
	Post-test	14.69	2.26						
S2	Pre-test	11.17	2.34	4.87	2.56	10.43	29	2.53E-11*	1.90
	Post-test	16.03	1.73						
S3	Pre-test	9.77	2.70	6.39	1.84	19.35	30	1.71E-18*	3.47
	Post-test	16.16	1.59						
TOTAL	Pre-test	10.14	2.94	5.41	2.79	19.34	99	1.71e-35*	1.94
	Post-test	15.55	2.02						

*Significant at 1% Level.

As gleaned from the table, the overall pre-test mean of 10.14 (sd=2.94) and the post-test mean of 15.55 (sd=2.02) had a mean difference of 5.41.The t-test revealed a t-value of 19.34 which also indicates high significance ($p < 0.01$) with large effect size (1.94). Hence the t-test for the three groups also indicated highly significant results. The result implies that the skills of the Grade III pupils in division were also improved.

Overall, the results of the t-test indicate highly significant differences in the multiplication and division skills of the pupils before and after the use of Math Bingo. Therefore, Math Bingo is effective and very useful in the improvement of the pupils' skills in multiplication and division.

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According to an article entitled Educational Value of Bingo Cards to Children (n.d), even kids are now entitled to enjoy the fun of playing the game of bingo. Parents and teachers are quite optimistic with the idea of teaching their students through the use of a bingo game to keep them entertained and to avoid boredom in their learning. With the use of customizable and printable bingo cards, parents and teachers can create a bingo card with a specific theme in mind. They can opt to create bingo cards with a particular topic such as related to school subjects as Mathematics, English and Science. The educational ideas on presenting the bingo game to children are quite numerous. Along the process of learning, the children are able to enjoy more while playing bingo which does not essentially make their learning tasking but fun instead. The educational concept of using the bingo cards as an entertainment and educational tool for children's learning is brilliant.

The results were supported by some studies. According to Kristesia et al, (2025), the findings indicate that students faced significant difficulties in understanding and applying these fundamental operations, leading them to rely on multiplication tables and resulting in low academic performance. This study highlights the importance of innovative and interactive teaching strategies to enhance students' understanding and support their cognitive development. Collaboration among teachers, parents, and the school environment is crucial in overcoming these challenges and improving mathematics learning outcomes.

Mathematics Bingo, a game-based learning activity, integrates fundamental arithmetic operations into a familiar and interactive format, making numeracy practice both enjoyable and educational. Quantitative research design was used wherein 117 students participated. The results revealed that before the implementation of the program, the students from three sections did not meet the expectations on the level of numeracy skills. After the implementation of MATGO, the level of numeracy skills changed significantly to a Very Satisfactory level. Moreover, a significant difference between the pre-assessment and the post-assessment scores was noted with a t-value of -15.4, degrees of freedom of 125, and a p-value of less than 0.001. On the other hand, the respondents encountered some issues and challenges in the implementation of MATGO that include Pressure to Win, Skill Level Differentiation, and Narrow Skill Focus with a corresponding mean score of 3.95, 3.92, and 3.91 respectively and verbally interpreted as great extent. Based on these results, the researchers proposed modifications to enhance the MATGO implementation. In general, the findings suggest that incorporating Mathematics Bingo into the curriculum can be an effective strategy for enhancing numeracy skills, offering a practical approach to achieving DepEd's numeracy enhancement goals.(Estrella V.D. & Martinez E.C., 2024)

According to Fatoki (2021), the result of her study revealed that there was a significant main effect of Bingo on pupils achievement in mathematics ($F(1, 110) = 3.327$; partial $\eta 2 = 0.131$).There was a significance main effect of quantitative ability ($F(1, 110) = 0.603$; partial $\eta 2 = 0.206$) on pupils achievement in mathematics. The high quantitative ability pupils (56.904) benefited from the treatment package more than their counterpart (31.451). There was significant two-way interaction effect of Bingo game and quantitative ability of the participants ($F(2, 106) = 1.543$; partial $\eta 2 = 0.214$) in favour of high quantitative ability pupils from Bingo game instructional strategy. The participants in Bingo game (14.07) had a higher mean value than their counterparts in the control (6.61). Bingo game instructional strategy improved pupils' achievement in mathematics. Primary school mathematics teachers should try to adopt this strategy in their teaching delivery.

Statistical analysis revealed that the difference in post-test scores between the two groups was significant ($p = 0.0181$), indicating the greater effectiveness of the game-based approach. The findings suggest that integrating educational games into mathematics instruction not only enhances learner engagement but also supports academic performance. The study concludes that Math Facts Bingo is a viable and effective strategy for improving numeracy skills and recommends its wider adoption in elementary classrooms. Future research should examine its long-term effects and applicability in other subjects and grade levels.(Balaoing V.G. & Say A.Q., 2025)

Overall, the improved results of the Grade Three learners signify that when learning is made enjoyable and interactive, pupils become more engaged, motivated, and confident, leading to higher achievement in their multiplication and division skills. The success of Math Bingo in this study reinforces the importance of using innovative, learner-centered strategies in mathematics instruction to support skill mastery and promote positive attitudes toward learning math in a way where children also enjoy.

V. CONCLUSION AND RECOMMENDATION

Based on the gathered evidence and the analyzed data, the researcher was able to draw conclusions that directly addressed the problems posed in the study which is its main focus was to determine the effectiveness of using Math Bingo as an innovative learning game in enhancing the Multiplication and division skills of Grade III pupils at Ilwas Elementary School. The research aims to explore how this engaging and interactive approach can help improve pupils' mathematical proficiency or skills, particularly in basic operations that often present challenges at the elementary level.

Before the use of Math Bingo, the pupils generally obtained pre-test scores that fell within the satisfactory level of performance in both multiplication and division. Specifically, the pupils recorded a mean score of 11.80 ($SD = 2.47$) in multiplication and 10.14 ($SD = 2.94$) in division. These results indicate that the learners possessed an average understanding of the basic operations prior to the intervention, with clear room for improvement in computational accuracy and fluency. To address these learning gaps, Math Bingo was introduced as an instructional game aimed at improving the pupils' multiplication and division skills while promoting enjoyment and active

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participation. The material was used by the teachers during the second grading period, coinciding with the lessons on multiplication and division. According to ST2, one of the participating teachers, Math Bingo effectively enhanced her pupils' skills while providing a fun and engaging classroom experience. She noted that her learners were always eager to play and would often request to use Math Bingo during class activities. Similar feedback from the other participating teachers reflected that the use of Math Bingo contributed positively to pupils' engagement and mastery of mathematical concepts.

The pupils' responses also supported these findings. Ninety-three percent (93%) of the pupils expressed that they enjoyed playing Math Bingo, while 7% responded that they somewhat enjoyed it. In terms of its effectiveness, 86% of the pupils believed that Math Bingo improved their multiplication and division skills, 6% said it made them happy, and 8% noted that it somewhat helped them. When asked about the contexts in which they used multiplication and division, 53% mentioned that their teachers allowed them to play Math Bingo during application activities, 42% related it to real-life situations such as buying items in stores or canteens, 31% connected it to counting money or things, 10% to dividing objects or money, and 7% to other daily uses. These findings show that Math Bingo not only enhanced their academic skills but also helped pupils apply mathematics in practical and meaningful ways.

After the implementation of Math Bingo, the pupils' post-test results reflected a remarkable improvement, reaching the very satisfactory level in both skills. The mean score for multiplication increased to 16.13 (SD = 2.21), while the mean score for division rose to 15.55 (SD = 2.02). This indicates a substantial improvement in their computational proficiency following the intervention. Furthermore, statistical analysis using the t-test confirmed that there were highly significant differences between the pre-test and post-test results. For multiplication, the computed value of $t = 16.21$ ($df = 99$, $p < .01$) indicated a highly significant improvement after the use of Math Bingo. Similarly, in division, the computed t-ratio = 19.34 ($df = 99$, $p < .01$) also revealed a highly significant increase in the pupils' performance. These findings clearly demonstrate that the Math Bingo intervention effectively enhanced the multiplication and division skills of Grade III pupils. The combination of play, practice, and engagement not only fostered enjoyment but also strengthened pupils' mastery of fundamental mathematical operations. The following conclusions were derived from the findings of the study. First, the Grade III pupils have satisfactory skills in multiplication and division prior to the use of Math Bingo. Second, Math Bingo is an effective intervention for the pupils to master their skills in multiplication and division. Pupils enjoy playing Math Bingo while they are learning and practicing their skills in multiplication and division. Math Bingo is often used in application or fixing skills of the lesson. Third, the Grade III pupils have very satisfactory skills in multiplication and division after the use of Math Bingo. Fourth, there is a significant difference in the multiplication skills of the Grade III pupils before and after using Math Bingo per section and over all three sectionms . Fifth, there is a significant difference in the division skills of the Grade III pupils before and after the use of Math Bingo per school and over all three sections.

Although the study resulted positive results and showed the effectiveness of Math Bingo in improving the multiplication and division skills of Grade III pupils, certain limitations should be acknowledged. First, the study was limited to a small sample of pupils within a single district, which may limit the external validity of the findings. The results shows the performance and attitudes of pupils in a specific educational setting, and therefore, may not fully applicable for learners in other schools or grade levels with different learning conditions, teacher expertise, or access to instructional materials. Second, the duration of the intervention was relatively short, as Math Bingo was conducted only during the second grading period. A longer exposure period could provide more in depth understanding into the long-term effects of game-based learning on mathematical proficiency and retention. Future research could benefit from using mixed-method approaches—combining quantitative and qualitative data—to validate findings through classroom observations, interviews, and focus group discussions.

In light of the findings of the present study, several directions for future research are suggested to further strengthen and expand the understanding of the effectiveness of Math Bingo as a learning tool in mathematics. Future researchers may consider replicating this study in different grade levels and educational settings to determine whether the effectiveness of Math Bingo remains consistent across various age groups, levels of ability, and school environments. By doing so, the applicability of the results could be enhanced and the intervention may be adapted to fit different classroom contexts. It is also recommended that future studies adopt a continuous design to examine whether the improvement in pupils' multiplication and division skills is prolonged over time. Such technique could provide valuable insights into the long-term recall and mastery of mathematical concepts learned through game-based strategies. Furthermore, researchers may explore the integration of Math Bingo with other subject areas or mathematical competencies such as problem-solving, fractions, and word problems to evaluate its broader applicability in enhancing improving overall numeracy skills. Comparative studies are likewise recommended to determine how Math Bingo performs against other innovative teaching startegies, such as digital math games, peer tutoring, or the use of manipulatives. This comparison could help determine the most effective strategy for improving pupils' mathematical performance. Additionally, future research could focus on the affective and performance related aspects of learning, including pupils' motivation, engagement, confidence, and attitude toward mathematics, to provide a more holistic and proper understanding of how game-based learning influences student outcomes. Another promising direction is to explore the role of teacher training and classroom management in the successful use of Math Bingo. Understanding how teacher preparedness and instructional

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support affect the results could offer practical insights for schools aiming to adopt the same strategies. Lastly, with the integration of technology in education, future researchers may develop and use a digital or interactive version of Math Bingo. This could further enhance or improve pupil engagement and make the learning experience more obtainable, especially in technology-driven learning environments. Overall, these suggested directions aim to build upon the current study and contribute to the continuous improvement of Mathematics instruction through creative and enjoyable learning strategies like Math Bingo that will surely help the learners.

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