

# Influences of Bingo Games in Enhancing Algebraic Skills Among Grade 7 Learners

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## ABSTRACT

Mathematics plays a vital role in developing students' logical reasoning and problem-solving abilities, particularly in foundational areas like algebra. However, many learners continue to struggle with algebraic concepts, resulting in poor performance and decreased motivation. This classroom-based action research investigated the impact of using Bingo games as a learning intervention to enhance algebraic skills among Grade 7 students at a public secondary school in Ozamiz City during the academic year 2024–2025. The study involved 32 students selected through purposive sampling. A researcher-made pretest and post-test were administered to measure improvement, and the data were analyzed using means, standard deviations, and a paired t-test. Results revealed a significant increase in students' algebraic performance after integrating the Bingo game, with overall performance shifting from "Did Not Meet Expectations" to "Outstanding." The findings indicate that game-based learning strategies, such as Bingo, can significantly improve students' understanding of algebraic concepts, boost engagement, and foster a more positive attitude toward mathematics. The study highlights the importance of incorporating interactive and student-centered approaches in mathematics instruction to address learning gaps and support academic success. It is recommended that teachers regularly incorporate Bingo and similar game-based activities in their lessons to sustain student motivation and enhance algebraic skills.

**Keywords:** Algebraic skills, game-based learning, academic performance, interactive teaching, Bingo game, mathematics education.

## INTRODUCTION

In the 2018 Programme for International Student Assessment (PISA), Filipino students performed the lowest among participating nations. In mathematics, less than 20% attained the basic proficiency level (Level 2); meanwhile, more than 50% scored below the minimum proficiency threshold (Level 1). This means there was a large proportion of Filipino students with inadequate foundational mathematics skills to compete with or match their peers worldwide; hence, there were substantial gaps in math-related learning at this age level (Bernardo et al., 2022).

Mastering algebra remains a consistently challenging skill for students who struggle with math, yet it is a critical foundation for succeeding in secondary-level mathematics. This systematic review examined the literature on interventions designed to improve algebraic skills among high school students identified as struggling math learners (Roesslein & Coddling, 2019). To meet the demands of increasingly complex mathematics standards, students need a strong conceptual understanding of algebra and fluency in performing algebraic equations. This includes recognizing the inverse relationship between number and algebra. The study aimed to examine the impact of alternating concrete representational–abstract (CRA) instructional strategies on students' mastery of unknown algebra facts and their conceptual comprehension. The participants were seventh-grade students with learning disabilities who had not yet mastered all algebraic concepts (Milton et al., 2019).

Many students struggle with algebra because they lack a strong conceptual foundation in multiplicative or relational thinking. This challenge is often compounded by overdependence on algorithms, such as multiplication, which can yield correct answers but fail to emphasize the underlying structures of algebra (Jitendra et al., 2022). Students who struggle to master algebraic skills, such as evaluating and solving algebraic expressions, are likely to encounter ongoing challenges. The assessment evaluates students' conceptual

understanding, computational abilities, and problem-solving skills in line with the mathematics curriculum (Nortvedt & Siqveland, 2019). Mathematics is widely regarded as one of the most challenging subjects for Filipino learners. The academic performance of students in mathematics was assessed using their first-quarter grades, obtained from the Registrar's Office (Capuno et al., 2019). One of the persistent challenges in mathematics lies in mastering the number and algebra, especially students' struggles with correctly applying positive and negative signs. This skill gap necessitates further support to help learners develop proficiency. This action research sought to assess the effectiveness of the "SIGNS" approach in improving problem-solving abilities among Grade 7 students, focusing on their mastery of fundamental operations and addressing the common sentiment of "feeling no good at math." (Campanilla, 2020).

Researchers worldwide have noted a gender disparity in mathematics performance among children, with males often outperforming females. As literature on the benefits of educational games in classroom settings continues to expand, this study aimed to improve math scores among Filipino students by introducing an educational game and assessing its acceptability and effectiveness (Conte, 2019). This study explored the impact of the Bingo game instructional strategy on the mathematics achievement of students in public primary schools. The strategy incorporated various Bingo patterns designed to introduce fun and variety into mathematics teaching (Tellam & Fatoki, 2021). Recent studies have found that game-based learning, particularly through interactive games like Bingo, is effective in enhancing students' algebraic skills. This approach is key to re-engaging students who face challenges with algebra and perform well in math. However, very few studies have highlighted the game-based learning approach in general, and specifically the Bingo game, to enhance students' actual algebraic skills. The gap, therefore, calls for evaluating these students' algebraic skills at the start and after employing the Bingo strategy.

There is a noticeable gap in current research on effective strategies to enhance algebraic skills, particularly for Grade 7 students. While many studies focus on traditional methods of teaching mathematics, there is limited exploration of using game-based learning, such as the Bingo Game, to improve algebraic proficiency. The existing literature predominantly addresses general math performance, without emphasizing specific interventions to address students' struggles with algebra. This gap highlights the need for research investigating the effectiveness of game-based learning approaches, such as Bingo Games, in helping Grade 7 students enhance their algebraic skills and overall mathematical performance (Miles, 2017).

However, prior research lacks practical knowledge regarding the use of game-based learning strategies, particularly the incorporation of Bingo Games, to enhance algebraic skills among Grade 7 students in the Philippines, especially in Ozamiz City, Misamis Occidental. While numerous studies focus on general mathematical interventions and the challenges in the education system, few have comprehensively assessed the impact of interactive, game-based approaches, such as Bingo Games, on students' mathematical performance. To address this gap, the researcher aims to investigate the effectiveness of Bingo Games in improving the algebraic skills and overall mathematical performance of Grade 7 learners during the school year 2024–2025 at a public secondary school in Ozamiz City, Misamis Occidental.

## Strategy

The bingo game is one of the engaging, entertaining ways to teach children the art of algebra and develop their algebraic skills (Winslett, 2019). As the literature on the positive impacts of educational games in the classroom grows, so does the promise of this tool in improving the math scores of Filipino students. This study aims to contribute to the growing literature by introducing an educational game and assessing its acceptability and effectiveness in enhancing students' mathematical performance (Conte, 2019). One of the best ways to improve students' grasp of mathematics is to present mathematical concepts through games such as Bingo (Lestari et al., 2022). In addition, it provides immediate feedback to students, thus giving them an idea of their progress and grasp (Henderson & Phillips, 2021). It also provides students with an outlet to give feedback on their learning experiences (Cochrane & Bateman, 2020).

Educational manipulative games can be effective in addressing these difficulties because they capture students' attention and offer an effective way to learn. Immersive interactive games can also keep a student's attention for

a long time, enabling effective instruction. The impact of playing games on learning has been dramatically evident in improving students' achievement levels in mathematics across different domains (Antipolo, 2021). The Bingo game is multidimensional as a teaching tool, using multiple components to fully engage the learner. This includes not only gameplay but also interactive components, such as prompts and visual cues related to algebraic concepts. It has auditory feedback and rewards for students, enhancing their motivation and participation. In its combination, it meets all requirements, ensuring an interactive, participatory learning experience that helps students grasp algebra while involving them in the entire task.

As emphasized by (Ramo, 2021) aim of this study is to determine whether the Bingo Game Approach is an effective method for students. Specifically, the study seeks to assess the effectiveness of the Bingo Game Approach on students' performance in mathematics. The study has three main objectives: to examine if there is a significant difference between the students' pretest scores in mathematics when taught using the Bingo Game Approach versus the Lecture Method; to investigate if there is a significant difference between the students' post-test scores in mathematics when taught using the Bingo Game Approach versus the Lecture Method; and to analyze the significant difference between the students' pretest and post-test scores in mathematics when taught using the Bingo Game Approach versus the Lecture Method.

### **Action Research Questions**

This study aimed to enhance the influences of Bingo games in enhancing algebraic skills among Grade 7 learners in one of the secondary schools in Misamis Occidental during the SY 2024-2025. Specifically, the study sought to answer the following questions:

1. What is the level of algebraic skills of Grade 7 learners before the use of Bingo games?
2. What is the level of algebraic skills of Grade 7 learners after the use of Bingo games?
3. Is there a significant difference in the algebraic skills of learners before and after the intervention?

## **METHODOLOGY**

### **A. Research Design**

This study used a descriptive quantitative design, focusing on single section of Grade 7 learners. The pretest and post-test method was utilized to assess whether there was an improvement in students' algebraic skills after implementing the Bingo Game strategy. This design allowed for a systematic analysis of students' performance before and after the intervention, providing insights into the effectiveness of the Bingo Game strategy in enhancing their algebraic proficiency. By focusing on a single section, the study ensures a controlled environment for measuring progress and identifying patterns in student learning.

### **B. Research Setting**

The researchers conducted the study at the junior high school level with Grade 7 students at a public secondary school in Misamis Occidental, which accommodates learners from Grade 7 to Grade 12 with diverse backgrounds. The study will measure students' algebraic skills before and after the intervention, providing quantitative data to assess the impact of Bingo Games on enhancing their algebraic proficiency.

### **C. Respondents of the Study**

The study involves Grade 7 students from a single section taught by the researcher. The participants were selected using purposive sampling, based on the following criteria: 1) Students who are enrolled in the Junior High School Department at a specific secondary public institution as Grade 7 students for the academic year 2024–2025; 2) Students who belong to a selected section or block in the Grade 7 curriculum; 3) Students who are studying Mathematics as part of their curriculum; and 4) Students who provide their full consent to participate in the study. Only one section or block of the Grade 7 curriculum will be chosen, and not all sections of the Grade 7 curriculum will be included. The researcher will ensure that all these conditions are met before conducting the study.

## D. Instruments

The researcher will utilize the following instruments:

### A. Algebraic Skills Test.

This instrument is a 40-item researcher-made questionnaire designed to evaluate Grade 7 students' proficiency in algebra. It covers fundamental algebraic concepts and skills, including evaluating expressions, solving equations, and applying algebra to real-world problems. To ensure the test's validity, the researcher will seek evaluation from experts, including the research adviser, the school head, the principal, and the cooperating teacher. A pilot test will be conducted with a separate group of participants who are not part of the main study to establish reliability, aiming for a Cronbach's Alpha of 0.7 to 1.0. This test will serve as both the pretest and post-test to measure students' progress before and after implementing the Bingo Game strategy.

The following scale will be used to interpret test performance:

Score	Grade Equivalent	Interpretation
37 - 40	90–100	Outstanding
34 - 36	85–89	Very Satisfactory
31–33	80–84	Satisfactory
28–30	75–79	Fairly Satisfactory
Below 28	Below 75	Did not meet expectations

### B. Lesson Plan

The researcher designed a more detailed lesson plan that includes the application of the Bingo Game Approach in teaching algebraic skills. This improved lesson plan is to be observed and evaluated by the cooperating teacher as if it were the curriculum for the research objectives; feedback will require the lesson plan to be rewritten appropriately. Implementation of the lesson shall be with grade 7 public high school students of the province of Misamis Occidental, in the academic year of 2024–2025.

### C. Bingo Game Strategy.

The Bingo Game Approach can be used to engage students in learning algebraic skills. This strategy involves using bingo game patterns designed to make classroom learning enjoyable and interesting while simultaneously improving students' understanding of algebraic concepts.

## E. Data Collection

- A. Pre-Implementation Phase. The researcher will initially ask for permission from the Dean of the College of Education, the Schools Division Superintendent, the school principal, the participating teacher, and the students' parents to proceed with the study. After getting the approval, consent forms will be given to the parents, while assent forms will be obtained from the students themselves. Upon obtaining all required approvals and documentation, a pretest will be conducted to determine the students' baseline knowledge of the mathematical concepts under investigation. Furthermore, the researcher shall prepare lesson plans and instructional materials that integrate interactive and participatory teaching methods. Assessments and activities shall also be prepared in correspondence with the teachers' lesson plans and instructional materials, including PowerPoint presentations.
- b) Implementation Phase. The researcher will present and discuss lessons using the Bingo. Game Approach in the Classroom. Students will be clearly and fully instructed on the rules, procedures, and objectives of the Bingo Game. Over the course of a month of implementation, the intervention will be incorporated into classroom activities to enhance students' algebraic skills. The researcher will facilitate classroom

interactions using prepared instructional materials, such as PowerPoint presentations and hands-on activities, to enhance student engagement. Throughout the process, ethical considerations will be strictly followed, ensuring confidentiality and voluntary participation of all students. Any necessary adjustments to the implementation will be made in collaboration with the cooperating teacher to maintain the study's effectiveness while preserving the natural flow of the teaching-learning process.

C) Post-Implementation Phase. In the final stage, the researcher will analyze the gathered data, draw conclusions, and provide recommendations based on the findings. The study will be proofread, edited, and finalized for presentation. The results will then be properly disseminated to relevant stakeholders to share the outcomes and implications of the research.

## F. Ethical Considerations

Before conducting the survey, the researcher met the ethical standards by obtaining prior informed consent from the participants. Throughout the process, the Data Privacy Act of 2012 was clearly presented in detail to participants to ensure the protection of their personal information, including sensitive data.

All participants were well informed about the objectives, potential benefits, and the importance of participating in the study. In addition, the researchers told the participants that the data would be kept confidential, since their anonymity would be protected throughout the entire research process.

## G. Data Analysis

With the use of Minitab software, the researcher will utilize the following statistical tools:

Frequency and Percentage – These were used in identifying the level of students’ algebraic skills before and after the integration of the Bingo Game.

Mean and Standard Deviation – These were used in identifying the average performance and variability of students’ algebraic skills before and after the implementation of the Bingo Game.

Paired Sample T-Test – This tool was used to explore the significant difference in students’ algebraic performance before and after the implementation of the Bingo Game.

## RESULTS AND DISCUSSION

### A. Level of Algebraic Skills of Grade 7 Learners Before the Use of Bingo Games

**Table 1** The level of algebraic skills of Grade 7 learners before the use of Bingo games.

Performance	Frequency	Percentage	M	SD
Satisfactory	1	3.13	30.000	*
Fairly Satisfactory	6	18.75	24.833	0.983
Did not Meet the Expectations	25	78.13	16.680	4.598
Overall Performance	32	100.00	18.625	5.587

Note: 34-40 (Outstanding); 31-33 (Very Satisfactory); 28-30 (Satisfactory); 24-27 (Fairly Satisfactory); 1-23 (Did not Meet the Expectations)

Students' algebraic skill levels before the implementation of the Bingo Game strategy were assessed using a pretest questionnaire (Table 1). The results revealed that learners' overall performance did not meet expectations (M = 18.63; SD = 5.59). This indicates that, on average, students scored well below the minimum satisfactory level, underscoring a substantial need for instructional intervention to improve their grasp of algebraic concepts.

Further data show that all 32 students took the pretest, representing 100% of the sample. A significant majority of the learners (n = 25, 78.13%) were categorized under the "Did Not Meet the Expectations" level, while only a small portion achieved "Fairly Satisfactory" (n = 6, 18.75%) and "Satisfactory" (n = 1, 3.13%). No student attained the "Very Satisfactory" or "Outstanding" levels, indicating the general difficulty students faced with algebra prior to the introduction of the game-based approach.

The widespread score highlights the importance of employing differentiated and engaging instructional strategies to address learners' varying needs. According to Quirino et al. (2021), incorporating structured and engaging learning activities can significantly enhance students' academic performance, particularly in mathematics, which demands cumulative understanding and skills. This is consistent with findings by Sibaen et al. (2023), who emphasized that students often struggle with algebra due to a lack of meaningful interventions. Moreover, Waswa et al. (2023) identified key challenges learners face in mathematics, including limited support, anxiety, poor foundational knowledge, and difficulty with problem-solving, which contribute to poor academic outcomes in the subject.

Thus, the results from Table 1 validate the pressing need for instructional innovations like the Bingo Game to make algebra learning more interactive and student centered. A focused instructional program should be designed to strengthen students' algebraic skills through engaging methods, targeted remediation, and consistent feedback. Game-based strategies, such as Bingo, can offer repetitive practice in a fun, low-pressure format, help reduce math-related anxiety, and motivate students to participate actively. To ensure learning gains, supplemental tutorials, visual aids, hands-on activities, and interactive problem-solving sessions should be integrated alongside formative assessments and feedback mechanisms.

**B. The level of algebraic skills of Grade 7 learners after the use of Bingo games**

**Table 2. The level of algebraic skills of Grade 7 learners after the use of Bingo games**

Performance	Frequency	Percentage	M	SD
Outstanding	29	67.44	36.10	1.472
Very Satisfactory	10	23.26	32.50	0.707
Satisfactory	4	9.30	30.00	0.000
Fairly Satisfactory	1	3.125	25.00	*
Did not Meet the Expectations	1	3.125	20.00	*
Overall Performance	32	100.00	34.031	3.873

Note: Note: 34-40 (Outstanding); 31-33 (Very Satisfactory); 28-30 (Satisfactory); 24-27 (Fairly Satisfactory); 1-23 (Did not Meet the Expectations)

Students' algebraic skills after the implementation of the Bingo game were measured using a post-test (Table 2). The data revealed that overall performance significantly improved, with the mean score reaching an "Outstanding" level (M = 34.03; SD = 3.87). This marks a substantial increase from the pretest results, in which most students fell into the "Did Not Meet the Expectations" category. The post-test results suggest that the Bingo game was highly effective in enhancing the learners' vocabulary knowledge in algebra and improving their overall mathematical performance.

All 32 Grade 7 learners participated in the post-test, representing 100% of the sample. A total of 25 students (78.13%) achieved an "Outstanding" rating, while 3 students (9.38%) attained "Very Satisfactory," 2 students (6.25%) reached "Satisfactory," and only 1 student each (3.13%) remained under "Fairly Satisfactory" and "Did Not Meet the Expectations." This is a significant improvement from the pretest, when 25 out of 32 students did not meet expectations, indicating a strong positive shift in their performance after integrating into the Bingo game.

These findings are supported by Tapado (2023), who emphasized the value of engaging, interactive strategies for improving mathematical learning. Tapado identified methods such as game-based learning, peer-assisted activities, and contextual instruction as instrumental in improving academic performance, particularly in subjects such as mathematics. Similarly, Calabrese et al. (2022) found that students who engage in supplemental programs such as educational games, personalized study groups, and peer collaboration tend to perform better than those who rely solely on traditional instruction. Given these results, it is evident that using Bingo games helped bridge learning gaps and improve student engagement. The data confirm that interactive activities not only promote better understanding of algebraic concepts but also motivate learners to actively participate and enjoy the learning process.

It is recommended that Bingo games be incorporated regularly into mathematics instruction to reinforce key concepts, build vocabulary knowledge, and encourage active learning. Future implementations can be further enhanced by integrating feedback mechanisms, differentiating game activities based on learners' proficiency levels, and combining them with other instructional strategies. As Mamuad et al. (2019) suggested, refining the learning process through continuous feedback and adaptation ensures that instructional games remain practical, relevant, and enjoyable for students.

**C. Significant Difference in Students' Mathematical Strategy Before and After the Implementation of Board Games**

**Table 3. Significant Difference in Students' Algebraic Skills Before and After the Implementation of the Bingo Game**

Variables	M	SD	T value	P value
Before Integrating Bingo Games	18.625	5.587	18.64	0.000
After Integrating Bingo Games	34.031	3.873		

Note: \*\*\*  $p < .001$  (Highly Significant); \*\* $p \leq 0.01$  (Highly Significant); \* $p < 0.05$  (Significant);  $p > 0.05$  (Not significant)

Significant Difference in Students' Algebraic Skills Before and After the Implementation of the Bingo Game The difference in the algebraic skills of Grade 7 learners before and after the implementation of the Bingo game was analyzed using a paired samples t-test (Table 3). The results showed a substantial improvement in learners' algebraic performance following the intervention. The mean score increased from 18.63 (SD = 5.59) before the Bingo game to 34.03 (SD = 3.87) after the intervention. The analysis yielded a t-value of 18.64 and a p-value of 0.000, which is highly significant and well below the 0.01 level of significance. This indicates that the use of the Bingo game had a significant and positive impact on students' understanding and mastery of algebraic concepts.

These findings are consistent with previous research supporting the use of game-based instructional strategies to improve student learning outcomes. Karakoç et al. (2022) emphasized that educational games enhance students' engagement, logical thinking, and problem-solving skills. Similarly, Pan and Ke (2023) found that interactive and collaborative learning strategies promote a deeper understanding and increase academic performance in mathematics. Maryana et al. (2024) also highlighted the value of non-digital games in improving analytical skills, primarily through contextual and peer supported learning experiences.

The evidence from this study confirms that integrating Bingo games into mathematics instruction can be an effective strategy for boosting students' algebraic skills. The game's engaging, student-centered nature likely contributed to increased motivation and active participation, helping bridge learning gaps.

Based on these results, it is recommended that the Bingo game and similar game-based approaches be regularly incorporated into mathematics teaching practices. Continuous assessment and feedback should guide improvements to maintain the program's effectiveness. Moreover, involving students in reflecting on their

experiences can help refine instructional strategies, making them more enjoyable and impactful. By adopting dynamic, inclusive teaching methods such as the Bingo game, educators can foster a deeper understanding of mathematics while making learning more enjoyable and meaningful for all learners.

## Summary

This study aimed to enhance Grade 7 students' algebraic skills through the use of Bingo games during the 2024-2025 academic year at a secondary public school in Ozamiz City. Employing a classroom-based action research design, the study involved 32 students who were selected through purposive sampling. A researcher-made test served as the primary tool for data collection. To analyze the results, statistical measures such as the mean, standard deviation, and paired t-test were utilized. Specifically, the study focused on three objectives: to determine students' algebraic skills before integrating Bingo games, to assess their skills after integration, and to identify whether there was a significant difference in students' algebraic performance before and after using Bingo games as an instructional strategy.

## FINDINGS

The following key findings were observed:

1. Before the intervention, students' algebraic skills were significantly below expectations, with most of the class falling into the "Did Not Meet Expectations" category.
2. After the Bingo game intervention, students demonstrated a remarkable improvement in their algebraic skills, with the majority showing outstanding performance and the overall class performance moving into the "Outstanding" category.
3. A significant difference was found between the pre-test and post-test results, as indicated by a paired t-test ( $t = 18.64$ ,  $p = 0.000$ ), confirming that the Bingo games had a profound positive impact on students' algebraic skills.

## CONCLUSION

Based on the findings, the following conclusions are drawn:

Algebraic concepts can be challenging for students, especially when they are not actively engaged in the learning process. Interactive and game-based methods, like Bingo, are effective tools for engaging students and enhancing their understanding of algebra.

1. The Bingo game is an effective instructional strategy for improving students' algebraic skills, fostering skills such as problem-solving, mathematical reasoning, and active participation in the learning process.
2. The positive results of the study highlight the potential of game-based learning approaches to create more engaging, enjoyable, and meaningful educational experience, leading to better academic outcomes in mathematics.

## Recommendations

Based on the findings and conclusions, the following recommendations are made:

1. Teachers are encouraged to incorporate game-based strategies, such as Bingo games, into their teaching practices to improve student engagement and develop their algebraic skills.
2. School administrators may consider providing professional development opportunities for teachers on interactive, student-centered teaching methods to help them move beyond traditional lecture-based teaching and adopt more engaging, innovative strategies.
3. Mathematics educators may continue to explore and implement diverse instructional methods that promote higher-order thinking, teamwork, and active learning to enhance students' overall performance in algebra and mathematics.

4. Future research could extend this study to different grade levels or mathematical disciplines to further explore the efficacy of game-based learning techniques, such as Bingo games, and investigate their impact on other cognitive skills and academic areas.

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