

From Numbers to Victory Laps: Accelerating Grade 8 Students' Numeracy Skills Using a Modified Math Racetrack Board Game

Christian F. Tambong

Lilo-an National High School, Lilo-an, Malinao, Aklan, Philippines

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Email of Corresponding Author: christian.tambong@deped.gov.ph

Abstract

This study was conducted to investigate the effectiveness of the Modified Math Racetrack Board Game in accelerating the numeracy skill level of 35 Grade 8 students at Lilo-an National High School for School Year 2024-2025, utilizing a mixed-methods quasi-experimental research design with a one-group pretest-posttest approach. Quantitative data were collected through the Enhanced Regional Unified Numeracy Test (E-RUNT), prescribed by the Department of Education, which was administered before and after a 5-week intervention program, while qualitative data were gathered through a Focus Group Discussion (FGD) among 8 purposively selected students. Research findings revealed that during pretest, majority of the students were categorized as Low Proficient and Non-Proficient with an over-all mean score of only 17.49 (Low Proficient). After the intervention program, posttest results significantly improved, with a substantial number of students already classified as Proficient and Highly Proficient with an over-all mean score of 30.60 (Proficient), yielding a mean difference of 13.11. The paired samples t-test indicated a statistically significant difference between the pretest and posttest scores ($p = .000$), signifying the effectiveness of the Modified Math Racetrack Board Game did not occur by chance. Qualitative findings strengthen these results, as students described the board game enjoyable, exciting, and fun, motivating, promoted independent learning and more preferred over traditional activities. Therefore, this study directly contributes to United Nations Sustainable Development Goal 4 (Quality Education) by promoting inclusive and equitable quality education through an innovative, learner-centered instructional intervention that enhances foundational numeracy skills essential for lifelong learning.

Keywords: Modified Math Racetrack Board Game; Numeracy Skills; Intervention Program; Grade 8 Students

1. Introduction

The mathematical skills students acquire from kindergarten through eighth grade form the foundational skills upon which all higher-level mathematics courses are built. It is highly beneficial for students to master previous mathematics concepts, applications, and abilities before learning algebra and other higher-level competencies. Gaining proficiency in skills such as early numeracy and fundamental operations like addition, subtraction, multiplication, and division is critical for achieving the benchmarks for mathematical competence at all grade levels (Mullis et al., 2016; National Mathematics Advisory Panel, 2008; Organization for Economic Co-operation and Development [OECD], 2014). The Department of Education aims to develop learners who are numerate and who can apply numeracy skills for various purposes. Since these skills form the foundation for learning all competencies across grade levels, the need for their assessment is of prime importance (Pelayo, 2023). Accordingly, in the pretest administration of the Enhanced Regional Unified Numeracy Test (E-RUNT) for S.Y. 2024-2025, Lilo-an National High School has recorded 11 (31.43%) non-numerates, 10 (28.57%) low proficient, and 6 (17.14%) nearly proficient Grade 8 students, whereby 27 (77.14%) of the class were categorized below proficiency level. These results indicated a very concerning issue in the school that needed an immediate intervention program.

These initial findings align with the international test results of the Programme for International Student Assessment (PISA) in 2018, in which the Philippines ranked second lowest among 79 countries in both mathematical and scientific literacy. Results indicate that only about 20 percent of Filipino students achieved the minimum in mathematical literacy. PISA concluded that there is an urgent need to improve the quality of basic education in the Philippines. Thus, improving literacy and numeracy, as well as creating "peace competencies," will be the priorities of the Department of Education (DepEd)'s review of the K to 12 curricula, according to Vice President and Education Secretary Sara Duterte (Philippine Institute for Development Studies). With this, every teacher must continually innovate intervention materials as well as strategies to stay abreast of the trends in students' needs and ultimately enhance the quality of the teaching-learning process. Several empirical studies have demonstrated that number-based board games are effective in enhancing children's numeracy development. Numerical plays not only immerse children in numerical environments but also give them multimodal cues

(e.g., visual-spatial, kinesthetic, temporal, and verbal-auditory) to understand the meaning of numbers and numerical relationships (Balladres et al., 2019).

Hence, the researcher decided to determine the effectiveness of number-based board games, specifically Math Racetrack, in addressing the numeracy problems of the Grade 8 students of Lilo-an National High School. Specifically, this study aimed to answer the question: What is the numeracy skill level of Grade 8 students during the Pretest of the Enhanced Regional Unified Numeracy Test (E-RUNT)? What is the numeracy skill level of Grade 8 students during the posttest of the Enhanced Regional Unified Numeracy Test (E-RUNT)? Is there a significant difference in the numeracy skill level of the Grade 8 students before and after the intervention? How does the Modified Math Racetrack Board Game improve the numeracy skills of Grade 8 students?

2. Material and methods

This study utilized a mixed-methods quasi-experimental research design, employing a one-group pretest-posttest approach to determine the effectiveness of the Modified Math Racetrack Board Game in improving the numeracy skills of 35 Grade 8 students of Lilo-an National High School for S.Y. 2024-2025 in the Division of Aklan wherein, they were subjected to a 5-week intervention program during vacant hours. The data-gathering instrument used was the Enhanced Regional Unified Numeracy Test (E-RUNT), a standardized test prescribed by the Department of Education to assess numeracy levels and profile learners in public schools across grade levels (Grades 1-11) for the implementation of immediate and appropriate intervention programs. The quantitative data were analyzed using descriptive and inferential statistics, including frequency, percentage, mean, and paired samples t-test utilizing the Statistical Package for the Social Sciences (SPSS). To triangulate and validate the quantitative results, eight students were purposively selected for a Focus Group Discussion (FGD), on which the qualitative data were then analyzed through a thematic analysis using ATLAS.ti.

3. Results and discussion

3.1. Numeracy Skill Level of Grade 8 Students during the Pretest of the Enhanced Regional Unified Numeracy Test (E-RUNT)

Table 1 presents the numeracy skill level of Grade 8 students during the administration of the pretest of the Enhanced Regional Unified Numeracy Test (E-RUNT). The data revealed that 11 students (31.43%) were classified as Non-Proficient, 10 students (28.57%) as Low Proficient, and 6 students (17.14%) as Nearly Proficient. However, only 6 students (17.14%) fell under the Proficient level, while a small portion, 2 students (5.71%) were categorized as Highly Proficient. This distribution indicated that the majority of the group demonstrated below-proficient numeracy skills because of the predominance of Non-proficient and Low Proficient learners. These findings imply that only a few showed a strong foundation on basic operations of integers. Furthermore, the overall mean score is 17.49, which is classified as Low Proficient only. This implies that their numeracy skills were generally weak opting the need for an intervention program that is age-appropriate and engaging for learners. These results are consistent with the studies of Bacit (2019) and Maysyaroh & Hidayati (2025) that Grade 8 students typically display low performance on pretests of numeracy assessment because their skills are still at basic level. This indicates that many students in the public schools do not meet expected numeracy benchmarks; however, their performance can be significantly improved through well-structured intervention program (Morata, 2024).

Table 1. Numeracy Skill Level of Grade 8 students during the Pretest of the Enhanced Regional Unified Numeracy Test (E-RUNT)

Score	F	%	Numeracy Level
0-9	0	0.00	Non-Proficient
10-19	1	2.86	Low Proficient
20-29	14	40.00	Nearly Proficient
30-35	9	25.71	Proficient
36-40	11	31.43	Highly proficient
$\bar{x} = 30.6$ (Proficient)			

3.2. Numeracy Skill Level of Grade 8 Students during the Posttest of the Enhanced Regional Unified Numeracy Test (E-RUNT)

Table 2 shows the numeracy skill level of Grade 8 students during the posttest of the Enhanced Regional Unified Numeracy Test (E-RUNT). The scores revealed that majority, or 14 students (40%) were classified as Nearly Proficient, 11 students (31.43%) as Highly Proficient, and 9 students (25.71%) as Proficient. Notably, only 1 student (2.86%) fell as Low Proficient and none as Non-Proficient. This distribution highlights the predominance of Nearly and Highly Proficient

students. The overall mean score is 30.6, categorized as Proficient. The results underscore that after the 5-week intervention program, the numeracy skills of the Grade 8 students improved. Therefore, the use of the Modified Math Racetrack Boardgame offers a promising solution for accelerating numeracy performance of low-performing students, while also serving as an effective enhancement activity for already proficient and highly proficient learners. These findings reinforce the claim that the Modified Math Racetrack Board Game could function as both remedial and enhancement material. These results corroborate with the studies of Ramani and Siegler (2024), Morata (2024), and Bacit (2019), who stated that structured numerical games improve students' number sense and further enhance post-intervention outcomes, especially for those who initially exhibited low proficiency in numeracy.

Table 2. Numeracy Skill Level of Grade 8 Students during the Posttest of the Enhanced Regional Unified Numeracy Test (E-RUNT)

Score	F	%	Numeracy Level
0-9	11	31.43	Non-Proficient
10-19	10	28.57	Low Proficient
20-29	6	17.14	Nearly Proficient
30-35	6	17.14	Proficient
36-40	2	5.71	Highly proficient
$\bar{x} = 17.49$ (Low Proficient)			

3.3. Test of Difference between the Numeracy Skill Levels of Grade 8 Students Before and After the Implementation of the Modified Math Racetrack Board Game

The table presents the comparison of the pretest and posttest scores of the Grade 8 students before and after the implementation of the Modified Math Racetrack Board Game. The results show that the overall pretest mean score is 17.49, while the posttest mean score is 30.60, yielding a mean difference of 13.11. Moreover, the test computed a p-value of .000 which is lower than the level of significance of 0.05, signifying that the difference is statistically significant and did not occur by chance. Hence, the null hypothesis must be rejected. Generally, the increased posttest results imply that the utilization of the Modified Math Racetrack Board Game as an intervention material has significant and positive effects on the numeracy skills of the students. This improvement suggests that game-based instructional approach effectively reinforces mathematical understanding and mastery of fundamental operations.

These results align with the studies of Del Rosario and Del Rosario (2023), Korakotengarm & Klinkesorn (2023), Putra et al. (2024), Galut (2022), and Sapin & Orbon (2022) who found statistically significant differences in students' numeracy performance before and after math boardgame utilization. They further confirmed the effectiveness of these kind of materials as an instructional strategy in addressing mathematical gaps.

Table 3. Test of Difference between the Numeracy Skill Levels of Grade 8 Students Before and After the Implementation of the Modified Math Racetrack Board Game

Aspects	Test Scores		Mean Difference	Sig. (2-tailed)	Decision	Interpretation
Grade 8 students	Pretest	17.49	-13.11	.000	Reject H_0	Significant
	Posttest	30.60				

3.4. Perceived Effects of the Modified Math Racetrack Board Game

After thorough identification, examination, and interpretation of patterns and themes of the qualitative data, it was found that the Modified Math Racetrack Boardgame is enjoyable, exciting, and fun, increases motivation because of its goal-orientated and reward-based nature, promotes independent learning, and more preferred over traditional activities.

3.4.1. Enjoyable, Exciting, and Fun

Students described the board game as enjoyable, exciting, and fun. Enjoyment and excitement became crucial factors of enhanced interest and focus. This transformed mathematics learning into an engaging experience, promoting positive attitudes towards the subject.

Student A stated, *"I am enjoying while learning."*

Student D added, *"This board game makes solving not boring."*

Student E shared, *"I like this game, it is exciting and fun. It seems like, were just playing while learning."*

Student B concluded, *"The board game is so fun!"*

3.4.2. Increases Motivation

Students expressed that the material increased their motivation because of its goal-oriented and reward-based system. The board games' competitive nature and presence of a mission-type activity, such as reaching the finish line, kept the students on track and persistent in solving the problems. This indicates how games can foster active participation in mathematics learning.

Student D remarked, *"I want to improve my solving abilities so that I will finish the race at the shortest time."*

Student B shared, *"The game makes you more motivated because you are competing with your partner. Of course, you don't want to lose, that's why you need to perform better."*

Student G stated, *"I am very persistent in finishing the track and winning the game."*

Student A concluded, *"The board game is amazing. It makes me motivated to learn."*

3.4.3. Promotes Independent Learning

Students highlighted that the board game enabled them become independent learners. The material can be utilized during their vacant hours, leading them to take ownership of their own learning. Thus, making the learning process learner-centered rather than teacher-centered.

Student B expressed, *"This game makes us become independent learners. We enjoyed playing it during recess and vacant time. My partner and I have bets like a piece of biscuit or a banana turon."*

Student A added, *"Yes. I agree. Even with just a little guidance of from our mathematics teacher, we are still learning."*

Student H shared, *"I can even play it at home. Even outside school, I can still learn fundamental operations of integers."*

Student C concluded, *"Definitely! My sister and I can play this game at home. We will both learn"*

3.4.4. Preference over Traditional Activities

Students preferred Modified Math Racetrack Board Game compared to the traditional classroom routine of directly solving on paper and chalkboard. They consider traditional activities as boring and passive, meanwhile, the board game as challenging yet exciting.

Student C stated, *"I like this game compared to solving on the board. I am enjoying!"*

Student A added, *"Solving on the board and paper is boring. I like this concept of racing until the finish line. I am enjoying while learning."*

Student B expressed, *"It is easy to improve our numeracy skills when we are exposed to this kind of math board game. Solving on paper is okay, but I like this more because we got to compete with our partners while enjoying."*

Student H concluded, *"I am sure that we will perform well in the next assessment because of this board game. I prefer this than the paper and pencil numeracy drill, because we don't feel any pressure in solving."*

4. Conclusion

Various assessments, both locally and internationally, have highlighted the deteriorating numeracy skills of Filipino students, a very alarming reality concerning our educational system today. This appeared to be primarily rooted in the early grade levels, where many students demonstrated lack of mastery of the basics specifically, the fundamental operations of integers—a prerequisite skill in understanding higher-level mathematical concepts. In response to this concern, the Department of Education has encouraged teachers to take steps by employing innovative teaching strategies that go beyond conventional approaches, as traditional methods often fail to sustain interest. This challenge has motivated the researcher to explore the use of the Modified Math Racetrack Board Game in accelerating students' numeracy skill levels. After its implementation, the findings revealed that it offers a promising solution in addressing existing numeracy problems. While the Modified Math Racetrack improved the numeracy skills, its true value lies how it transformed mathematics learning from traditional routinary activities into a fun, exciting, and an enjoyable experience that fosters both independence and intrinsic motivation. Over-all, the study suggests that innovative and student-centered instructional materials should be adopted by teachers because they have the power to address learning gaps, nurture foundational skills, and inspire students to see mathematics as a subject of exploration, engagement and purposeful learning.

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Conflict of interest statement

The author declares no financial or personal conflict of interest and confirms that no external party influenced the conduct or outcome of the study.

Statement of ethical approval

The researcher took ethical considerations in conducting the study. He made sure that participants have full knowledge and understanding about the nature and objectives of the study and they have the right to refuse and withdraw their participation if they wish to. Moreover, they were assured that their identity and the data gathered from them will be treated with utmost privacy and confidentiality.

Statement of informed consent

Letter of consent was secured from the authorities and student participants prior to the data gathering procedure.

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Author's short biography

Christian F. Tambong

A Special Science Teacher I who finished Master of Arts in Education major in Mathematics in 2023 and currently pursuing Doctor of Philosophy major in Educational Leadership and Management at Aklan State University Banga Campus. Research of interest mainly focuses on Mathematics, Leadership and Management.



Modified Math Racetrack Board Game (Sample)

