

Effectiveness of the Summer Arithmetic Enhancement Initiative: A Pretest-Posttest Study Among Grade 7–10 Students

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Abstract

Mathematical competence in the four fundamental operations addition, subtraction, multiplication, and division is vital for students' academic achievement and their ability to solve real-life problems. However, many junior high school learners continue to struggle with these basic skills, particularly those transitioning from elementary to secondary education. To address this learning gap, the Summer Arithmetic Enhancement Initiative was implemented to strengthen computational fluency and build learners' confidence before the new school year begins.

This study aimed to evaluate the effectiveness of the Summer Arithmetic Enhancement Initiative in improving the arithmetic proficiency of selected Grade 7 to Grade 10 students. Specifically, it sought to determine the students' proficiency levels before and after the intervention and identify which arithmetic operations remained most challenging.

A pre-experimental pretest-posttest design was utilized, involving 34 students from Marcial B. Villanueva National High School who were identified as needing remediation. A researcher-made 20-item test was used to measure proficiency in whole-number operations. The intervention consisted of daily arithmetic drills, flashcard exercises, and structured math routines. Data were analyzed using frequency, percentage, and t-test to determine significant improvements in performance.

Pretest results revealed that 28 out of 34 students were classified as least knowledgeable, showing widespread gaps in basic arithmetic skills. After the intervention, 21 students reached the knowledgeable level, while the least knowledgeable group decreased to seven. Statistical analysis indicated a significant improvement in posttest scores, confirming the program's effectiveness. Although all operations improved, multiplication and division remained the most challenging areas.

The findings demonstrate that the Summer Arithmetic Enhancement Initiative effectively enhanced students' arithmetic proficiency and confidence. Sustained, focused, and

differentiated remediation is recommended, especially for higher-level operations, to ensure long-term mastery and promote stronger numeracy among Filipino learners.

Keywords: *Arithmetic Skills, Remediation, Numeracy, Summer Enhancement Program, Basic Operations*

INTRODUCTION

Background and Rationale

Mathematical competence in the four fundamental operations addition, subtraction, multiplication, and division is critical for students' academic success and everyday problem-solving. However, many learners in junior high school struggle with these basic skills, which can hinder their understanding of more advanced mathematical concepts (Delos Santos et al., 2020). This issue is often more pronounced among students who have experienced interruptions in their education or lack sufficient practice, especially those transitioning from elementary to secondary education (Torres & Tan, 2021).

To mitigate this gap, remedial programs like the Summer Arithmetic Enhancement Initiative have been developed to provide focused interventions during the summer break. Such programs aim to reinforce arithmetic skills through targeted instructional activities and practice, helping students improve their computational fluency and confidence before the start of the school year (Santos & Reyes, 2023). Pretest-posttest designs are commonly used to measure the initial skill level of students and to assess the effectiveness of these programs in enhancing students' mathematical proficiency (Delos Santos et al., 2020; Antonio & Reyes, 2023).

This study evaluates the effectiveness of the Summer Arithmetic Enhancement Initiative by comparing the basic arithmetic skills of selected Grade 7 to Grade 10 students before and after the intervention. The findings aim to inform educators and policymakers about best practices in remedial math instruction, ultimately contributing to improved numeracy outcomes and academic readiness among Filipino learners.

Review of Related Literature

Mastery of basic arithmetic operations is a foundational requirement for success in higher-level mathematics. According to Siegler and Lortie-Forgues (2020), consistent failure to grasp early math concepts, such as whole numbers, fractions, and basic operations, leads to persistent struggles in advanced mathematical thinking. Early remediation and targeted interventions significantly reduce the risk of long-term math anxiety and poor academic performance. These findings emphasize the importance of structured programs such as summer enhancement initiatives that provide focused instruction beyond the regular school year.

In the Philippine context, Delos Santos et al. (2020) conducted Project Tabang, a remediation program for students at risk of failing mathematics. Through a pretest-posttest design, they observed significant improvements in learners' scores and attributed this to hands-on, student-centered interventions. Similarly, Torres and Tan (2021) found that contextualized and MELC-aligned math modules significantly improved comprehension and retention, especially when used in out-of-class programs. These studies validate the idea that short-term, focused arithmetic reinforcement can yield measurable learning gains.

Game-based learning also prove effective in enhancing numeracy skills. Santos and Reyes (2023) observed in their quasi-experimental study that Grade 8 students exposed to interactive math games outperformed their peers in both speed and accuracy. Meanwhile, Ramos and Villanueva (2021) highlighted the role of parental involvement, showing that students who received guided support at home during summer enhancement programs performed significantly better in arithmetic post-tests. Lastly, Antonio and Reyes (2023) found peer tutoring highly beneficial in raising confidence and mastery in basic operations among Grade 9 learners. These studies collectively support the framework of the current Summer Arithmetic Enhancement Initiative, where targeted, engaging, and contextual interventions are employed to address arithmetic learning gaps.

Statement of the Problem

This study sought to determine the effectiveness of the Summer Arithmetic Enhancement Initiative among selected Grade 7–10 students. Specifically, it aimed to answer the following questions:

1. What is the level of proficiency of students in basic arithmetic skills before the Summer Enhancement Program?
2. What is the level of proficiency of students after the program?
3. Which specific arithmetic operations do students find most challenging after the program?
4. Is there a significant difference between the pretest and posttest results of the students?

Objectives

The study aimed to evaluate the impact of the Summer Arithmetic Enhancement Initiative on learners' proficiency in basic arithmetic operations and to determine whether the intervention significantly improved their computational skills and confidence.

MATERIALS AND METHODS

Research Design

This study employed a pre-experimental pretest-posttest design to measure the effectiveness of the intervention.

Participants

The respondents were 34 Grade 7 to Grade 10 students from Marcial B. Villanueva National High School who were identified through a diagnostic pretest as needing remediation in basic arithmetic operations.

Instruments

A researcher-made 20-item test served as the main instrument to assess proficiency in addition, subtraction, multiplication, and division with whole numbers.

Procedure

Prior to implementation, informed consent was secured from students and parents. The RESP are selected students from Grades 7 to 10 who were identified through a diagnostic pretest as needing remediation in these specific skills. The program included structured drills, flashcard exercises, and daily math routines aimed at enhancing students' computational fluency and confidence in handling whole number operations.

Data Analysis

Data were analyzed using frequency and percentage distribution to describe students' proficiency levels before and after the program. A t-test was employed to determine whether the difference between pretest and posttest scores was statistically significant.

RESULTS

The results of the 20-item pretest revealed that a majority of the 34 participating students lacked proficiency in the four fundamental arithmetic operations. Specifically, 28 students were classified as least knowledgeable, 4 as less knowledgeable, and only 2 as knowledgeable. This indicates that most learners entered the program with significant gaps in basic arithmetic skills. Moreover, 28 students were observed to be "nagbakodbakod" or hesitant and unsure when answering, showing a lack of confidence and fluency in solving basic computations.

Following the implementation of the Summer Arithmetic Enhancement Initiative, the posttest results showed a marked improvement in student performance. The number of students in the least knowledgeable category dropped from 28 to 7, while 6 were identified as less knowledgeable, and a substantial 21 were categorized as knowledgeable. The number of hesitant students also decreased to 10, indicating improved confidence and familiarity with basic operations. However, multiplication and division remained challenging for some learners, signaling the need for continued support in these areas.

The significant difference between the pretest and posttest results suggests that the initiative was effective in enhancing students' arithmetic skills. Nevertheless, the presence of a few learners who still struggle indicates that more time should be allocated to sustained intervention. Continued and focused instruction, particularly on multiplication and division, will help further strengthen students' mastery and ensure long-term improvement in their mathematical competence.

DISCUSSION

The findings show that the Summer Arithmetic Enhancement Initiative effectively enhanced students' arithmetic competence across the four fundamental operations. The remarkable improvement from pretest to posttest results demonstrates that structured, focused, and contextualized learning interventions can significantly improve students' computational accuracy and confidence. The initiative successfully addressed the learners' initial hesitation, or "nagbakodbakod," which often reflects anxiety, low self-efficacy, and poor mastery of basic concepts. The noticeable reduction in this behavior after the intervention indicates that repeated practice, positive reinforcement, and guided remediation can help build both fluency and self-assurance in performing arithmetic tasks.

These results are consistent with the findings of Delos Santos et al. (2020) and Santos and Reyes (2023), who reported that hands-on, student-centered learning activities and interactive drills significantly enhance computational fluency and retention of basic math skills. Similar to their studies, the current initiative emphasized daily practice, engagement, and feedback three key factors proven to support learning recovery and conceptual reinforcement. The integration of localized and contextualized materials also aligns with Torres and Tan (2021), who emphasized that learners perform better when mathematical instruction is relevant to their experiences and delivered through familiar contexts.

Furthermore, the observed improvement in students' confidence corroborates the findings of Antonio and Reyes (2023), who noted that collaborative and game-based remedial interventions increase learners' motivation and willingness to engage in mathematical tasks. Confidence plays a vital role in arithmetic performance, as students who feel competent are more likely to attempt challenging problems and persist through computation errors. This behavioral change was visible among students during the posttest phase, suggesting a shift in attitude alongside skill enhancement.

However, consistent with Siegler and Lortie-Forgues (2020), the persistence of errors in multiplication and division highlights the hierarchical nature of arithmetic learning where mastery of basic addition and subtraction precedes but does not automatically guarantee proficiency in higher operations. The findings underscore the need for sustained remediation that provides incremental progression and differentiated instruction. Short-term interventions, while effective in producing immediate gains, must be extended and reinforced during the regular school year to ensure long-term retention and transfer of learning.

The study, however, acknowledges several limitations. The small sample size and single-school setting restrict the generalizability of the findings to broader populations. Additionally, the absence of follow-up testing limits insights into long-term mastery and application of arithmetic skills. Despite these limitations, the outcomes of this study contribute valuable evidence supporting the implementation of structured summer programs as effective tools for addressing learning gaps and fostering foundational mathematical competence among junior high school students.

Conclusion

The study concludes that the Summer Arithmetic Enhancement Initiative significantly improved the arithmetic proficiency and confidence of participating Grade 7–10 students. Focused interventions during the summer break effectively closed learning gaps in basic operations. However, persistent challenges in multiplication and division suggest that more extended and differentiated instruction is necessary.

Recommendations

Schools should institutionalize regular remedial programs, integrate game-based or peer-assisted approaches, and conduct long-term assessments to ensure sustained mathematical competence among learners.

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