

## **The mathematics skill building experiences and the performance of Grade 5 learners: Basis for a proposed enhancement program**

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### ABSTRACT

The study examined the relationship between mathematics skills-building experiences, including number exercises and problem-solving exercises, and the mathematics performance of Grade 5 learners in Antongalon Elementary School, East Butuan District 1, Division of Butuan City, during the 2020-2021 school year. It used a descriptive-survey research design. There were 98 respondents in the study who were chosen through a universal sampling method. The research instrument used was the mathematics skill-building experience. Performance in mathematics was assessed through research questionnaires and statistical techniques, including frequency count, percent, weighted mean, mean percentage score, and correlation analysis. The findings indicate that respondents frequently engaged in number and word problem-solving exercises, utilizing fingers for basic operations and adhering to proper steps in multiplication and division. Most showed satisfactory or fairly satisfactory performance in mathematics. However, results showed no significant relationship between their skill-building activities and math performance. The following conclusions are drawn: Regular practice with number exercises and word-solving problems helps students develop their mathematical skills. The following recommendations are made: Students should focus on the division number operation to enhance their knowledge and skills by understanding each step of the process. Remedial and tutorial classes should be offered by the school to improve students' knowledge and problem-solving abilities. Under the direction of the math teacher, students should diligently study their math lessons to perform better. To confirm the validity of its findings, another researcher will conduct a study akin to this one. Higher-ranking DepEd officials must approve the proposed mathematics enhancement program to advance the students' mathematical proficiency.

**Keywords:** mathematics, skill building experiences, word-solving problems

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## INTRODUCTION

Mathematics plays a vital role in cultivating learners' critical thinking, logical reasoning, and problem-solving abilities. For Grade 5 learners, this stage marks a significant transition from basic arithmetic to more advanced operations, including fractions, problem solving, and multi-step procedures. However, many Filipino learners continue to underperform, as reflected in both national and international assessments such as the National Achievement Test (NAT) and the Trends in International Mathematics and Science Study (TIMSS). These consistently low scores highlight a persistent gap between the expected competencies and actual learner performance.

Firsthand classroom experiences have revealed that, despite frequent drills and exercises, many students struggle to grasp fundamental concepts, particularly in solving problems involving fraction division and operations with addition and subtraction. Often, learners rely on rote memorization or physical counting rather than developing a conceptual understanding of mathematical processes. This observation prompted reflection on whether current mathematics activities are truly effective in enhancing learners' actual performance.

This study examined the relationship between mathematics skill-building exercises—specifically number drills and word problem-solving tasks—and the academic performance of Grade 5 learners at Antongalon Elementary School, Butuan City. The investigation sought to determine whether these activities significantly influence achievement in mathematics. The research aligns with the Department of Education (DepEd) Order No. 12, s. 2020, which introduced the Most Essential Learning Competencies (MELCs) to focus on crucial skills learners must master, particularly in light of challenges posed during and after the COVID-19 pandemic. Despite this targeted curriculum, mastery of core topics such as fractions remains low.

Preliminary findings indicated that while learners engaged regularly in mathematics exercises, no significant relationship emerged between these activities and their actual performance. This suggests that attention must shift from the quantity to the quality and delivery of these learning experiences. In response, this study proposed a Mathematics Enhancement Program specifically designed to address identified learning gaps, particularly in visualizing and solving fraction-related problems. Grounded in the MELC framework, the program aims to provide contextualized, targeted interventions to strengthen foundational mathematical skills.

The study is anchored in established learning theories that emphasize the cognitive and developmental needs of learners. Piaget's theory of cognitive development underscores the importance of active learning, where students assimilate and accommodate new information to achieve cognitive equilibrium. In mathematics, such active engagement fosters deeper understanding and the acquisition of lifelong problem-solving skills. Complementing this perspective, Vygotsky's concept of the zone of proximal development (ZPD) highlights the role of guided interaction with more knowledgeable others, enabling learners to accomplish tasks just beyond their independent capabilities. This collaborative approach is especially effective in developing problem-solving and critical thinking skills in mathematics.

Within the Philippine basic education framework, mathematics instruction aims to cultivate critical thinking, problem-solving, and the ability to make mathematical connections. It encompasses key strands such as numbers and number sense, measurement, geometry, patterns, functions, algebra, and data analysis and probability. This study, targeting learners in the concrete operational stage of development, integrates both cognitive and ZPD-based approaches, ensuring that interventions are developmentally appropriate and responsive to learners' needs. By aligning

with national curriculum standards and leveraging evidence-based theories, the research seeks to contribute to more effective mathematics instruction and improved learner outcomes.

### Statement of the problem

The study aimed to determine the relationship between the mathematics skill-building experiences and the mathematics performance of Grade 5 Learners in Antongalon Elementary School, East Butuan District, Division of Butuan City, for the School Year 2020-2021 as a basis for an enhancement program. Specifically, the study sought to answer the following questions:

1. What is the pupils' level of mathematics skill-building experiences in terms of number exercises and word problem-solving exercises?
2. What is the pupils' level of mathematics performance?
3. What are the pupils' least-learned skills in mathematics?
4. Is there a significant relationship between the pupils' level of mathematics skill-building experiences and their mathematics performance?
5. Based on the findings of the study, what enhancement program may be proposed to improve the mathematics performance of the learners?

### METHODOLOGY

This study employed a descriptive research design to provide a comprehensive account of the mathematics skill-building experiences of Grade 5 learners and their corresponding performance in mathematics. The design was chosen not only to present an accurate description of these variables but also to determine whether a significant relationship existed between them, applying appropriate statistical treatments to draw conclusions. The research was conducted at Antongalon Elementary School, East 1, Butuan District, Division of Butuan City. The school is located in Barangay Antongalon along the National Highway and can be reached via Bayugan-bound buses from Butuan City. For School Year 2020–2021, the school had a total population of 637 pupils and 20 teachers. The Grade 5 level consisted of three sections—Narra, Yakal, and Molave—with enrolments of 34, 32, and 32 pupils, respectively. Eight teachers, including the researcher, were assigned to teach mathematics at this grade level.

The study involved all 98 Grade 5 learners from these three sections, using a universal sampling design that ensured every member of the population was included as a participant. Of these, 34 pupils, or 34.7% of the total, came from Section Narra, while 32 pupils, or 32.6%, came from Section Yakal, and another 32 pupils, also 32.6%, came from Section Molave. This complete enumeration eliminated sampling error concerns and ensured the representativeness of the data.

Two primary instruments were utilized for data collection. The first consisted of two questionnaires designed to assess mathematics skill-building experiences: the Mathematics Skill-Building Experience in Terms of Number Exercises and the Mathematics Skill-Building Experience in Terms of Problem-Solving Exercises. Each questionnaire contained ten declarative statements framed in the first-person or possessive point of view, to encourage learners to self-assess honestly without feeling external pressure. Responses were recorded on a five-point Likert scale: 5 – Strongly Agree, 4 – Agree, 3 – Neutral, 2 – Disagree, and 1 – Strongly Disagree. Weighted means of responses were calculated and interpreted using the following categories:

1.0–1.8 (very low), 1.81–2.6 (low), 2.61–3.4 (moderate), 3.41–4.2 (high), and 4.21–5.0 (very high). The questionnaires were adapted from the research work of Basford et al. (2012) and were modified to suit the learners' comprehension level, including translating each statement into Filipino to aid pupils with limited English proficiency.

The second instrument was the Performance in Mathematics Research Questionnaire, composed of 30 items aligned with the competencies specified in the Most Essential Learning Competencies (MELC) for the first quarter. The initial test bank contained 50 items, which underwent expert validation by three Master Teacher I educators from Antongalon Elementary School, two mathematics teachers and one English teacher, who evaluated the instruments for content, grammar, and face validity. These validators recommended rephrasing items into declarative statements, ensuring age-appropriate language, and including Filipino translations. The validation process resulted in all three experts rating the instruments as "excellent." For the performance test, the original 50 items were administered in a pilot test to 100 fifth-grade learners from Taligaman Elementary School. Based on item analysis, nine items with a facility index below 0.20 (too difficult) and six items with a facility index above 0.90 (too easy) were discarded. The final version contained 30 items, all within the 0.20–0.80 difficulty range. The instrument achieved a reliability coefficient of 0.86, indicating strong internal consistency. Scores in the performance test were classified into the following categories: 25–30 (outstanding), 19–24 (very satisfactory), 13–18 (satisfactory), 7–12 (fairly satisfactory), and 1–6 (did not meet expectations).

The data gathering procedure began with securing formal approval from the Schools Division Superintendent (SDS) of Butuan City. Upon receiving permission, the researcher sought the consent of the school principal and informed the advisers of the Narra, Yakal, and Molave sections about the study's objectives and procedures. Ethical protocols were strictly observed, with letters sent to parents outlining the study's goals and methodology, requesting consent for their children's participation. These letters were distributed on Mondays, coinciding with the release of learning modules. Parents indicated their consent by signing the letters; all 98 consent forms were returned signed, allowing full participation. The letters also explained that the teacher-researcher would personally administer both the first-quarter examination and the skill-building questionnaires in a face-to-face format, to ensure authenticity of responses, while minimizing exposure to pathogens by conducting the administration in one session. Safety measures such as social distancing, wearing of face masks, and hand sanitation were enforced throughout.

The administration of the instruments took place during the first week of December 2020. Learners were reassured that they could request assistance from the teacher for clarification or translation of specific words. They were given sufficient time to complete the instruments, with the mathematics performance test requiring up to one hour and the skill-building questionnaires approximately 30 minutes. Given the geographical proximity of all participants within Antongalon, the researcher was able to visit all learners within two weeks to complete the administration process.

Once collected, the data were tallied, tabulated, and analyzed. For mathematics skill-building experiences, frequency counts, percentages, and weighted means were computed, with interpretations following the same categorical scale used in the questionnaires. For mathematics performance scores, classifications were based on the established categories from "outstanding" to "did not meet expectations." The least-learned competencies were identified through computation of the Mean Percentage Scores (MPS) for each competency, obtained by dividing

the mean score by the number of items assigned to the competency, then multiplying by 100. The resulting percentages were classified into mastery levels: 96–100% (mastered), 86–95% (closely approximating mastery), 66–85% (moving towards mastery), 35–65% (average mastery), 16–34% (low mastery), 5–15% (very low mastery), and 0–4% (absolutely no mastery).

The study applied a range of statistical treatments to ensure thorough analysis: frequency count to determine the number of respondents in each skill-building and performance category; percentage to convert these frequencies into proportional values; weighted mean to determine average scores on the questionnaires; mean and MPS to identify least-learned competencies; and correlation analysis to determine whether a significant relationship existed between the pupils' mathematics skill-building experiences and their mathematics performance. This rigorous methodological approach ensured the accuracy, validity, and reliability of the findings while adhering to ethical research standards.

## RESULTS AND DISCUSSION

Pupils' level of mathematics skill-building experiences in terms of number exercises and word problem-solving exercises

The pupils' level of mathematics skill-building experiences was measured in terms of number exercises and problem-solving exercises. In terms of number exercises, results showed that 86 learners or 87.76% were within the "High" level, 5 learners or 5.10% were within the "Very High" level, 4 learners or 4.08% were within the "Moderate" level, and 3 learners or 3.06% were within the "Low" level, with no respondents falling in the "Very Low" category. Analysis of the individual indicators revealed that all activities in the questionnaire were often experienced by the learners, with the highest weighted mean of 4.06 obtained by the indicator "I use my fingers in adding or subtracting numbers" ("Ginagamit ko ang akingmgadalirisapagdaragdag o pagbabawas ng mganumero"), suggesting that finger counting remains a common and preferred method for addition and subtraction. This supports the claim of Oswald (2020) that finger counting is an effective strategy for early math learning and is further reinforced by Kullberg's (2019) neuroscientific evidence that it is a key component of mathematics skill development.

Indicators 3, 6, and 10, which obtained weighted means of 3.86, 3.60, and 3.72 respectively, also fell within the "High" category, showing that learners exert effort and practice in number exercises. This is consistent with the study of Chen et al. (2018), which linked a positive attitude toward mathematics to increased engagement of the hippocampal learning-memory system, thereby influencing learning outcomes. Indicators 5, 7, and 8, with weighted means of 3.52, 3.69, and 3.60 respectively, indicated that learners often memorized and practiced steps for basic operations—addition, subtraction, multiplication, and division—which aligns with Barnes' (2020) assertion that working memory is essential for quick retrieval of numerical information, and that direct practice with immediate feedback improves fluency. Indicators 4 and 9, with weighted means of 3.86 and 3.79 respectively, demonstrated the presence of knowledgeable others—such as parents and siblings—in supporting learners' number exercises, echoing Silinskas' (2019) finding that home support increases persistence during homework. The overall average weighted mean for number exercises was 3.74, interpreted as "High."

For problem-solving exercises, 83 learners or 84.69% were in the “High” category, 4 learners or 4.08% were “Very High,” 8 learners or 8.17% were “Moderate,” and 3 learners or 3.06% were “Low,” with none in the “Very Low” category. The highest weighted mean, 3.99, was obtained by the indicator “I use drawing or sketch to solve a mathematics problem in sentence form” (“Ginagamit ko ang mgadibuho o pagguhitsapaglutus ng pangungusap ng problemasamatematika”), indicating a preference for visualizing problems before solving them. This finding supports Fergusson’s (2020) claim that diagrams bridge the gap between textual and symbolic mathematical language and serve as an effective tool for communicating solutions. Indicators 3, 6, and 10, with weighted means of 3.72, 3.63, and 3.84 respectively, reflected a positive attitude toward problem-solving, again supporting Chen et al.’s (2018) findings on the cognitive benefits of such an attitude. Indicators 5, 7, and 8, with weighted means of 3.45, 3.62, and 3.66, showed that learners often memorized and practiced problem-solving steps, consistent with Barnes’ (2020) assertion regarding working memory’s role in mathematics mastery. Indicators 4 and 9, with weighted means of 3.73 and 3.74, again pointed to strong home support as a contributing factor to persistence, consistent with Silinskas (2019). The overall average weighted mean for problem-solving exercises was 3.72, also interpreted as “High.”

#### Pupils’ level of mathematics performance

The pupils’ level of mathematics performance, determined through scores in a 30-item first-quarter examination, showed that 3 learners or 3.1% attained “Outstanding” scores (25–30), 21 learners or 21.4% were “Very Satisfactory” (19–24), 39 learners or 39.8% were “Satisfactory” (13–18), and 35 learners or 35.7% were “Fairly Satisfactory” (7–12). No learners were in the “Did not meet expectations” category (1–6). The majority of learners, therefore, fell under the “Satisfactory” category.

#### Pupils’ least-learned skills in mathematics

The analysis of least-learned competencies, based on MELC and using Fernandez’s (2013) mastery categorization, revealed that competencies with Mean Percentage Scores (MPS) below 35% included solving routine and non-routine problems involving factors, multiples, and divisibility rules for 2, 3, 4, 5, 6, 8, 9, 10, 11, and 12 (MPS 8%, “Very Low Mastery”); solving routine and non-routine problems involving addition and/or subtraction of fractions using appropriate strategies (MPS 13%, “Very Low Mastery”); solving routine or non-routine problems involving multiplication without or with addition or subtraction of fractions and whole numbers (MPS 10%, “Very Low Mastery”); visualizing division of fractions (MPS 15%, “Very Low Mastery”); and solving routine or non-routine problems involving division without or with other operations of fractions and whole numbers (MPS 15%, “Very Low Mastery”). The competency “Visualizes multiplication of fractions using models” had an MPS of 20%, interpreted as “Low Mastery.” These findings align with Nadhi’s (2020) assertion that low procedural knowledge impedes overall mathematics learning, as strong performance depends on both conceptual and procedural mastery.

Other competencies were mastered or closely approximating mastery, such as “Uses divisibility rules for 2, 5, and 10” (MPS 98%, “Mastered”), “Uses divisibility rules for 3, 6, and 9” (MPS 93%, “Closely Approximating Mastery”), and “Shows that multiplying a fraction by its reciprocal is equal to 1” (MPS 96%, “Mastered”). Several competencies were at “Average

Mastery,” including using divisibility rules for 4, 8, 12, and 11 (64%), performing PMDAS/GMDAS operations (52%), finding GCF and LCM using continuous division (54%), solving real-life problems involving GCF and LCM (48%), adding and subtracting fractions with or without regrouping (61%), multiplying fractions and whole numbers (58%), mentally multiplying proper fractions (47%), and dividing fractions and whole numbers (55%).

Relationship between the pupils’ level of mathematics skill-building experiences and their mathematics performance

The correlation analysis examined relationships between mathematics skill-building experiences and mathematics performance. Results showed a positive but low correlation between number exercises and mathematics performance ( $r = 0.131$ ,  $p = 0.199$ ) and between problem-solving exercises and mathematics performance ( $r = 0.062$ ,  $p = 0.544$ ). Both were statistically insignificant at the 0.05 level, leading to the non-rejection of the null hypothesis that no significant relationship exists between pupils’ mathematics skill-building experiences and their performance.

Proposed enhancement program

In light of these findings, a proposed enhancement program for Mathematics V was developed, targeting the least-learned competencies. The program includes remedial classes for solving routine and non-routine problems involving factors, multiples, and divisibility rules; addition and subtraction of fractions; multiplication and division of fractions and whole numbers; and visualization of multiplication and division of fractions. Strategies involve the use of Strategic Intervention Materials (SIM), spinner games via Kahoot, puzzles, peer tutoring, manipulatives, models, and arts integration. Implementation schedules range from November 2021 to March 2022, with each competency allocated a budget of ₱5,000 to cover materials and activities. The program aims for 100% participation and to elevate learners from “Very Low Mastery” to at least “Average Mastery” in the targeted competencies.

## CONCLUSION

The study sought to determine the relationship between mathematics skill-building experiences, specifically in terms of number exercises and problem-solving exercises, and the mathematics performance of Grade 5 learners in Antongalon Elementary School, East Butuan District 1, Division of Butuan City, during the school year 2020–2021. It involved 98 respondents selected through a universal sampling method and employed a descriptive-survey research design. Three instruments were utilized: the Questionnaire on Mathematics Skill-Building Experiences in Terms of Number Exercises, the Questionnaire on Mathematics Skill-Building Experiences in Terms of Problem-Solving Exercises, and the Questionnaire on Mathematics Performance. Data analysis employed frequency counts and percentages to classify learners into levels of mathematics skill-building experiences and performance, mean and mean percentage scores to determine the least-learned competencies, weighted means to assess the average scores in the skill-building questionnaires, and correlation analysis to establish the significance of relationships between the variables.

Findings revealed that the majority of learners demonstrated a “High” level of skill-building experiences in both number exercises and problem-solving exercises. In number exercises, learners often used their fingers to add or subtract, displayed a positive attitude toward practicing numerical tasks, relied on memorization to enhance fluency in basic operations, and frequently received assistance from parents and siblings. Similarly, in problem-solving exercises, most learners often used drawings or sketches to solve problems in sentence form, maintained a positive disposition toward mathematical challenges, practiced consistently while memorizing problem-solving steps, and benefitted from the support of family members.

Despite these high levels of engagement, the learners’ overall mathematics performance was only “Satisfactory.” Analysis of mean percentage scores revealed several least-learned competencies, particularly those involving procedural knowledge, such as solving routine and non-routine problems with factors, multiples, and divisibility rules; performing operations with fractions and whole numbers; and visualizing multiplication and division of fractions. The study found a low positive but statistically insignificant relationship between skill-building experiences and mathematics performance, suggesting that frequent engagement in number and problem-solving exercises does not necessarily translate into higher performance when procedural knowledge is lacking.

These findings lead to the conclusion that while learners are confident and adept at using strategies such as finger counting and illustration, as well as memorizing processes for basic mathematical operations, gaps remain in their ability to apply procedural knowledge to more complex problems. This deficiency in procedural fluency appears to hinder their ability to obtain correct answers for more challenging tasks, even when conceptual understanding or confidence is present. Addressing these gaps requires targeted interventions focusing on procedural mastery in the least-learned competencies, including solving problems involving factors, multiples, and divisibility rules; performing operations with fractions; and visualizing multiplication and division of fractions.

Given these conclusions, learners are encouraged to strengthen both their conceptual and procedural knowledge by consistently practicing the solving of routine and non-routine problems. Mathematics teachers are advised to reconsider their instructional strategies, providing richer opportunities for learners to engage with multiple representations and visualizations of mathematical concepts. They should also undertake professional development to enhance their content knowledge, pedagogy, and pedagogical content knowledge (PCK), as deficiencies in these areas are linked to learners’ difficulties with least-learned competencies (Guma, 2019). Parents and siblings should continue to serve as active home support systems, as such involvement is associated with greater task persistence during homework (Silinkas, 2019). It is further recommended that they receive training to improve their own conceptual and procedural understanding of mathematics so they can serve as effective tutors at home. Finally, future researchers are encouraged to explore the interplay of pedagogical content knowledge components among mathematics teachers to inform more effective instructional approaches.

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