



DIVISION-MULTIPLICATION HOP IN SOLVING NUMBERS OF GRADE 4 LEARNERS

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ABSTRACT

Engaging the learners in solving problems enhances their creative and logical thinking. Making them involved is allowing them to discover the result. Problemization-oriented game-based math tasks with structuring features enhanced students' reasoning with problems and channeled it to doing mathematics (Ke et al., 2024). For the previous years, based on the school data of Lul-Luno Elementary School, the mean percentage of learners in mathematics of Grade IV learners is seen as low and doesn't reach at least 75%, and one of the least learned is solving multiplication and division numbers. This study aims to enhance the number sense of learners in Grade IV in solving numbers with the operations of division and multiplication through Division-Multiplication Hop. Purposive sampling is used to identify the participants, composed of 5 males and 7 females in Grade IV. This study aims to involve a traditional game that would make the learners learn with a twist. The quasi-experimental studies used pre-tests and post-tests to assess the learners. From the conducted pre-test, the mean score is 9.25, and it is increased in the post-test to 14.1666666666667. The proficiency level of the participants in mathematics increased wherein 1 female is in nearly proficient, 3 males and 4 females are proficient and 2 males and 2 females are highly proficient. Findings

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revealed that through the learning intervention division-multiplication hop, the MPS results in mathematics of learners increased. The research revealed that play-based learning encouraged the confidence of pupils to participate and challenged every learner to solve and find the correct answer. Joy is seen in the faces of participants. Teachers in Lul-Luno Elementary School are encouraged to adopt the game-based learning intervention Division-Multiplication Hop and can contextualize it through using other operations that can adhere to the needs of the learners. Through repetition of these activities, the needs of every learner can be enhanced. Furthermore, learners' engagement and manipulation of different instructional materials can develop the cognitive and physical skills of learners.

Keywords: *number sense, enhance, play-based, engagement*

INTRODUCTION

Numbers, operations, and problem solving are all encountered in our daily life, which are all in mathematics, and yet many of the learners are struggling in solving. Others also hate mathematics, which stresses their studies. Teaching numeracy to young learners is crucial for their lifelong learning. Children with low performance in early numeracy are at risk of facing learning difficulties in mathematics, and frequent and long-term interventions are needed for the positive effects to last (Lopez-Pedersen et al., 2022).

Teachers need to be vigilant in strategies and techniques, for the conditional direct and indirect effects of early numeracy skills on G4 math achievement suggest that children

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who had more proficient early literacy skills utilize strategies beyond just early numeracy skills to solve G4 math problems and that children's strategies to solve math problems may be enhanced by the proficiency of their literacy skills (Chang, 2023). At an early age, children are taught how to count and write numbers before learning the four basic operations. Numeracy skills are not just learning what numbers are; they are learning creatively and critically how to solve the problem with the basic operations.

Almost no students in the Philippines were top performers in mathematics, meaning that they attained Level 5 or 6 in the PISA mathematics test (OECD average: 9%). Six Asian countries and economies had the largest shares of students who did so: Singapore (41%), Chinese Taipei (32%), Macao (China) (29%), Hong Kong (China)* (27%), Japan (23%), and Korea (23%). At these levels, students can model complex situations mathematically and can select, compare, and evaluate appropriate problem-solving strategies for dealing with them. Only in 16 out of 81 countries and economies participating in PISA 2022 did more than 10% of students attain Level 5 or 6 proficiency (*PISA 2022 Results (Volume I and II) - Country Notes: Philippines,* 2023). According to Balatas *et al.* (2019), continuous curriculum improvement of the Philippines' K–12 curriculum and implementation of relevant intervention programs and support systems from different education stakeholders, including country-based publishing and testing companies, are needed to address gaps in competencies found for the country to meet international benchmarks. Using a curriculum analysis matrix, the findings indicate that K-12 curricula may require conceptual and pedagogical refinements, particularly in the area of constructive alignment, technology integration, and specificity of its

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components. Barrot (2021) *states that* to uplift the education of Filipinos, the K-12 curriculum was enhanced and became the Matatag Curriculum, which will be gradually implemented in each grade. Innovation and creativity in teaching mathematics are necessary to make learners love mathematics. Creativity and problem solving are considered to be twenty-first-century competencies; therefore, promoting mathematical creativity should be an important part of school mathematics (Matić & Sliško, 2022).

Teachers need to think about teaching methods that indirectly motivate students to learn (Barekat, 2022). Teachers can take advantage of children's curiosity for math when they organize creative learning environments and develop meaningful critical thinking experiences to increase children's interactions with peers (Harris, *n.d.*), and a play-based approach to early mathematics certainly has great potential to become an innovation (Vogt *et al.*, 2018). Luluno Elementary School, as shown from the consolidated mean percentage score of learners in mathematics from grades 4 in S.Y 2022-2024, found out that it was below 75%, and including from the least learned are multiplying two numbers and dividing two numbers without regrouping.

SCHOOL YEAR	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
	Mean Percentage Score			
2022-2023	55.16	54.16	60.6	63.3
2023-2024	63.3	64.5	60.83	54.16
2024-2025	56.88	57.71		

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As a result of MPS shown from the data above and based on the analysis of the MPS, the result is fluctuating, affected by the comprehension and behavior of learners. As observed, the grade 4 learners are low proficient in understanding some mathematical terms because of the language shifting from mother tongue in grade 3 to English as a medium of instruction in grade 4. Another is that learners are poor in number sense; thus, this research aims to encourage learners in grade four to improve their number sense in solving numbers using multiplication and division.

To meaningfully develop young learners' number sense, activities need to be sufficiently engaging to retain their interest and be presented in a manner that club practitioners, who might not be teachers, are able to facilitate (Bowie & Graven, 2024). To achieve this, the teaching of mathematics facts involves the use of various games. The principles of multisensory instruction and concrete-representational-abstract (CRLA) progression are deemed beneficial in addressing students concerns in the mathematical learning (Greenes, *n.d.*). The development of multiplication and division understanding and fluency has a central role in the grade 3-5 Common Core State Standards for Mathematics (CCSSM) (Hulbert *et al.*, 2023). Early educators should use guided play with lots of activities to enhance pupils' achievement in numerical skills (Popoola, 2014).

The study aims to enhance the competencies of Grade 4 learners in multiplying two numbers with and without regrouping and dividing two numbers with and without regrouping through the application of a play Division-Multiplication Hop.

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Play is the source of development and creates the zone of proximal development (Vygotsky, 1967). Recent scholarship suggests that sensory experiences are not limited to the five cardinal senses but involve a range of other specific senses as well as combinations of senses (Güneş et al., 2024). **According to Yekple et al. (2021) traditional play games, sustain learner interest towards learning and opens up multi- sensory learning behavior in them. Division-Multiplication Hop** is a game-based learning enhanced from one of the Filipino traditional games, hopscotch. According to Van Putten et al. (2020) Non-digital game-based learning methodologies are accessible in terms of cost effectiveness, providing opportunities for social interactions while learning, and demanding few prerequisite skills. The aim of this game is to enhance the solving skills of pupils in multiplication and division skills. The rules and steps of this game is enhanced from the article published by the National Library board authored by Tan, Bonny (Tan (n.d)).

It can be played on a variety of courts, which are essentially geometric arrangements of squares. This game is applicable to learners who struggles in solving multiplication and division. In every square it has numbers and operation (division or multiplication) wherein the player must solve the given number not later than 15 seconds and should finished the game within 5 minutes. They can have their paper and ballpen in answering.

Playing this game, the player should choose one square to hop in every row. Before they hop, they must tell what is written in the box as well as their answer. If the player lands their feet on the square without getting the correct answer, they do not get the points. If the player loses balance while solving, they do not get the points. If the wrong multiple is called

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out, the player does not get the points. If the player step on the lines, they are out and fall in line again. All players are only allowed to hold their pen and paper when it is there time to play or hop. All players must fall in line and play with monitored time, those players who answered correctly and with a lesser time is called winner while the players who did not meet the final square will go back to the line and try again. The player who did not succeed in the first try can only play 3 times and with 3 seconds deduction from the time and score in each try. For the final score, all the time of each try will have 3 seconds deduction in each and be added all together.

The numbers and operations can be modified. This intervention can be done 15-20 minutes after class in the afternoon every Tuesday and Thursday. According to Thabologo and Kesianye (2024) the parental involvement level before and after the intervention marked a difference. Parent's consent will also be given to ensure that parents grant the participation of their children at this hour. The benefit of this numeracy game for learning is its ability to create a lively and interactive learning environment (Juwiantho & Sidarta, 2024).

METHODOLOGY

Research Design

Quasi-Experimental Quantitative approach is used and purposive sampling for it is more ethical to use. It allows the researcher to study the same causal relationship without the ethical issues. Quasi-Experimental Quantitative approach is used to compare the performance of the learners before and after applying the intervention. The result of the test of learners in

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mathematics will be analyzed through t-test wherein t-test is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another (*An Introduction to T Tests / Definitions, Formula and Examples*, 2023).

Research Participants

This study focuses on the improvement of the learner's in solving numbers in multiplying with or without regrouping and dividing numbers with and without regrouping. Purposive sampling is done to Grade 4 Learners of Lul-luno Elementary School. Wherein there will be 5 males and 7 females with a total of 12 learners who will participate in this research. The parent consent of the participants will be distributed and ensured to be informed about the intervention schedule.

Research Instruments

The researcher will utilize questionnaire adopted from Coronel et al. (2010) Mathematics for a Better Life pp. 58-94 with the three types of tests. The 1st part will be multiple choice, the 2nd part will be matching type, and the 3rd part will be the solving of numbers related to multiplying two numbers with and without regrouping and dividing two numbers with and without regrouping. The result of the pre-test and post-test will be analyzed through the T-test.

Data Gathering Procedure and Analysis

The researcher uses quasi-experimental research using purposive sampling. The reason for purposive sampling is the better matching of the sample to the aims and objectives

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of the research, thus improving the rigor of the study and the trustworthiness of data and results (Campbell et al., 2020). The researcher will use pre-test and post-test questionnaires in gathering the data. The questionnaire will be adopted from Coronel et al. (2010) Mathematics for a Better Life pp. 58-94 with the three types of tests. The 1st part will be multiple choice, the 2nd part will be matching type, and the 3rd part will be the solving of numbers related to multiplying two numbers with and without regrouping and dividing two numbers with and without regrouping.

The researcher will make a communication letter to the office of the principal and to the grade 4 learner's parents as the process of gathering the data. Upon the approval of the research, the researcher will disseminate the time schedule and the process of intervention during PTA meetings with the presence of the teachers, learners, parents, and principal. The source of funds will be through donations, and the procurement of the materials will be done after the approval.

Data analysis is a significant methodological component when conducting quantitative education studies (Abulela & Harwell, 2020). Upon the approval of the research proposal, the data are gathered from the pre-test of learners, and intervention will be applied before the post-test of the Grade IV learners. Paired T-test will use to compare the means of the pre-test and post-test to identify whether the Division-Multiplication Hop has a significant difference. The T-test for independent samples will be used to interpret and compare the results mean of the pre-test and post-test, wherein a small p-value, typically below 0.05, indicates a statistically significant difference between groups, meaning you can reject the null

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hypothesis and conclude that there is a meaningful difference between the means, while a large p-value suggests no significant difference (*An Introduction to T Tests / Definitions, Formula and Examples*, 2023).

Ethical Considerations

Permission was sought from the respondents' parents, the head of the school, and the respondents themselves. During the PTA meeting, the goal of the pre-test and post-test was conveyed to all. Each parent will receive a thorough analysis of the outcome. The respondent's response will be kept confidential and will not have an impact on their academic standing. The 1987 Constitution states that one of the essential rights upheld by the State as a component of an individual's rights is privacy (Cada, 2021). Participation by the respondent will guarantee that it has no impact on their class schedule and will instead greatly inspire them as a student.

RESULTS AND DISCUSSION

The pre-test score of the respondents is almost half of the post-test, wherein there is a 59 difference in the overall score. The pretest mean is 9.25, while the posttest mean is 14.16, with a difference of 5. The table below shows the results and discussion of the performance of the respondents in solving multiplication and division applying the Division-Multiplication Hop as an Intervention.

Table Title: Proficiency Level of Grade IV pupils in solving numbers using the two solving operations multiplication and division before the implementation of Division-Multiplication Hop

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Table 1: Proficiency Level of Grade IV pupils before the implementation of Division-Multiplication Hop

Respondents	n	Mean	MPS	Standard Deviation	Descriptive Rating
Grade 4 (5 males & 7 females)	12	9.25	56.88	2.416	Nearly Proficient

MPS	Descriptive Equivalent
90-100	Highly Proficient
75-89	Proficient
50-74	Nearly Proficient
25-49	Low Proficient
0-24	Not Proficient

Table 1 shows the mean, mean percentage scores, standard deviation and descriptive rating of the mean percentage scores of the learners before the integration of Division-Multiplication Hop. Based on the data the result is low. The standard deviation of 2.416 indicates moderate variability among the students' scores. This implies that while some students are close to the mean, others may be performing significantly better or worse. The use of multiplication and division in solving was taken on the first and second quarter of the school year but definitely used continuously on the different competencies in the third and fourth quarter. Therefore, innovations and strategy of a teacher is needed in order to improve the number sense in solving problems using multiplication and division of learners.

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Table Title: Proficiency Level of Grade IV pupils in solving numbers using the two solving operations multiplication and division after the implementation of Division-Multiplication Hop

Table 2: Proficiency Level of Grade IV pupils after the implementation of Division-Multiplication Hop

Respondents	n	Mean	MPS	Standard Deviation	Descriptive Rating
Grade 4 (5 males & 7 females)	12	14.16	84.42	1.114	Proficient

MPS	Descriptive Equivalent
90-100	Highly Proficient
75-89	Proficient
50-74	Nearly Proficient
25-49	Low Proficient
0-24	Not Proficient

In this world that is full of distractions learner now a days are distracted and hardly focused on a given tasked. According to Oxford Learning most students are able to concentrate easily on activities that are fun and enjoyable but lose their ability to concentrate on activities that appear more boring or difficult. The path towards more inclusive, active

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participation of low achieving students in the learning of mathematics could be better mitigated through the heart (i.e., the affect) rather than wholly via the brain (i.e., cognition) (Tay et al., 2023). According to Klein (2024) Play is essential to the healthy growth and development of children. As children play, they explore new roles, try out new ideas, and bond with each other.

Based on the result of the given data after the application of the Division-Multiplication Hop the mean, MPS, Standard deviation increased and improved the proficiency level of pupils. From nearly proficient to proficient learners.

Table Title: Significant Difference in Solving Number Using the Operation Multiplication and Division before and After Integrating the Division-Multiplication Hop

Table 3:

Respondents	n	Mean	Standard Deviation	T-Critical	P-value	DF	Descriptive Rating
Grade 4 (5 males & 7 females)	12	14.16	84.42	2.1314	0.00001195	15	Proficient

Table 3 presents the results of a t-test comparing the means before and after the intervention. The calculated t-critical value is 2.1314. The p-value is reported as 0.00001195. The degrees of freedom (DF) are 15.

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Based on the T-test the extremely low p-value (0.00001195), which is far less than the conventional significance level of 0.05, indicates that there is a statistically significant difference in the mean scores before and after the implementation of the "Division-Multiplication Hop." The t-critical value would be used to determine significance if we were comparing it to a calculated t-statistic, which is not provided here. However, the very small p-value strongly suggests that the observed increase in the mean score is not due to random chance.

Conclusion

The implementation of the "Division-Multiplication Hop" teaching strategy resulted in a statistically significant improvement in the proficiency level of Grade 4 pupils in solving numbers using multiplication and division. The students progressed from a "Nearly Proficient" level before the intervention to a "Proficient" level afterward. This positive change, supported by a very low p-value, indicates that the "Division-Multiplication Hop" is an effective method for enhancing students' understanding and skills in these mathematical operations.

Given the positive and statistically significant impact of the "Division-Multiplication Hop" on the Grade 4 pupils' proficiency in solving multiplication and division problems, it is recommended that this teaching strategy be adopted and integrated into the other grades. Furthermore, it would be beneficial to:

- **Share the "Division-Multiplication Hop" strategy and its positive outcomes with other educators** within the school and potentially across different schools or

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districts. This could be done through workshops, presentations, or sharing of instructional materials.

- **Conduct further research with a larger and more diverse sample size** to validate these findings and explore the potential benefits of this strategy across different student populations and learning contexts.
- **Investigate the specific aspects of the "Division-Multiplication Hop" that contribute to its effectiveness.** Understanding the underlying mechanisms could lead to further refinement and optimization of the strategy.
- **Explore the applicability of similar "hop" strategies for other mathematical operations or concepts** where students might face difficulties in understanding the procedural steps.

By adopting and further investigating the "Division-Multiplication Hop," educators can potentially enhance mathematics instruction and improve student outcomes in foundational arithmetic skills.

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