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Math-Simplex Intervention to Improve Multiplication Skills of Grade Five Learners

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Abstract

This action research aimed to improve the multiplication skills of Grade five learners in multiplication. A specific instructional method Math-Simplex (Simple to Complex) Method was designed and implemented among the 35 grade 5 learners of St. Mary Village Elementary School District of Sta.Maria Central, Schools Division of Bulacan during the school year 2024-2025. The implementation of this method was hypothesized to positively impact the multiplication performance of the learners, ultimately improving multiplication skills in Mathematics. Results revealed a significant improvement to post test result, from a very low pre-test result. Hypothesis was rejected after it was found out that there was a significant difference between the two assessments. Learners perceived the intervention as highly effective to improve their multiplication skills.

Keywords*: Multiplication skills, Math-Simplex Method, Effectiveness*

INTRODUCTION

Multiplication skill is an essential mathematical function that is important for a learner's comprehension of numbers and their connections. For elementary students, developing these skills establishes the groundwork for higher-level mathematical ideas. Mastery in 4 Fs are critical component of the acquisition of more intricate mathematical concepts. It is a critical instrument for resolving real-world issues that involve sharing, collaboration, and measurement, and it fosters the development of logical thinking and reasoning skills, thereby assisting students in gaining a more profound understanding of mathematical relationships. The mastery of this competency instills confidence in students' mathematical capabilities, thereby facilitating their academic success. It establishes the groundwork for advanced mathematics, fosters the development of logical reasoning skills, and encourages the resolution of problems. Teachers can assist students in acquiring a comprehensive understanding of this fundamental mathematical operation by offering them opportunities to practice and employ division in a variety of contexts.

In the Philippines, the poor academic achievement in Math was also reflected in Trends in International Mathematics and Science Study (TIMSS), as it scored 297 in the scale with a range of 0–1,000 (TIMMS,2019). The country came in last out of 58 countries in the world in the 2019.In the PISA 2018 International Report, the average score of Filipino students in mathematical literacy was 353 points,

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markedly lower than the OECD average of 489 points, signifying a proficiency below Level 1 (OECD, 2019). Achieving below the lowest proficiency level in the PISA, these Filipino students are evidently trailing in mathematics education; over half of this age group lacks sufficient mathematical skills when compared to their counterparts globally. The weak performance in mathematics differed in extent among students from public and private schools, with averages of 343 and 395, respectively (Department of Education 2019).

Similarly, in St. Mary Village Elementary School, 35 learners out of 41 in Grade Five -Carlos P. Garcia section were found to be non-numerates in Project All Numerates Pre-Test. This can be accounted to two primary reasons. Firstly, they lack foundational skills in four fundamental operations (addition, subtraction, and multiplication and division. Secondly, the approach used in regular classes is less engaging because students, at their level, tend to have shorter attention spans. As referenced by Sandoval (2023), at the age of approximately 8-9 years, students are continuing to develop their cognitive skills, which encompass their capacity to concentrate and maintain attention for longer durations. Their brains have not yet fully matured to sustain attention on abstract ideas such as those commonly seen in mathematics.

It is from this phase that the researcher as Math teacher in this study was urged to conduct this action research to improve the multiplication skills of the Grade five learners. The teacher-researcher will develop an intervention called 3Cs to improve the grade five learners' performance in multiplication. This intervention utilized a material with Cover, Copy and Compare context. This is an instructional technique used to improve students' accuracy and fluency in multiplication facts. This intervention material is composed of individualized multiplication facts to be answered through Cover, Copy, Compare Process. This intervention promotes the acquisition of multiplication facts. Each respondent is regularly given an individual sheet containing multiplication facts to practice. This will be implemented as a drill part of the lesson.

Conceptual Framework

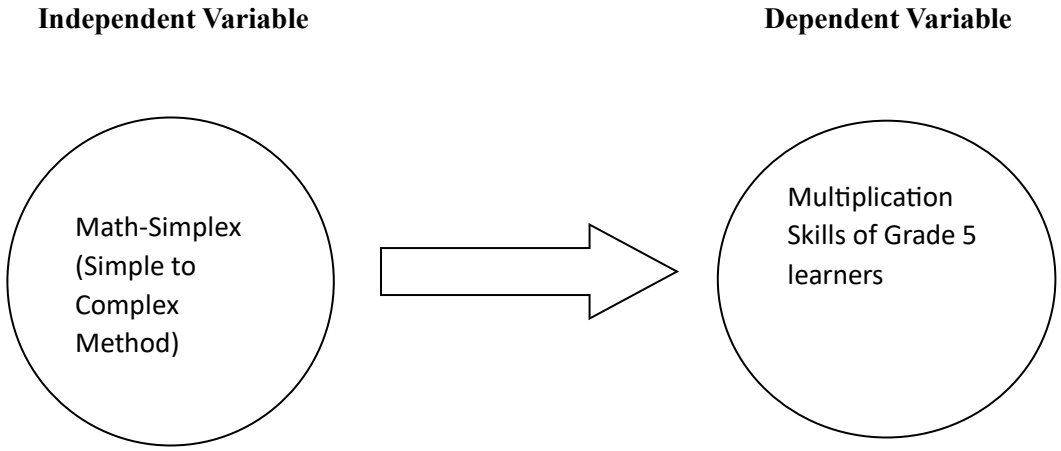

Figure 1. Conceptual Framework of the Study

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The general concept of this research is to improve the multiplication skills of the grade five learners. To make this research possible, the Math-Simplex Method was developed by the researcher involving three phases: The skip counting phase, the array phase and number sentence phase. Skip counting involves repeatedly adding the same number. It builds a foundational understanding of multiplication as repeated addition. The intervention will begin by the concept of multiplication is like adding the same number multiple times. Researcher used visual aids like number lines or hundreds of charts to highlight the skip counting pattern. In Phase 2, the array method was employed using rows and columns to visually represent multiplication. It helped students understand the concept of area and how numbers can be arranged in a structured manner. The resarcher provided worksheets where students create arrays for given multiplication problems. In Phase 3, Number Sentence Method was employed by which it involves writing out the multiplication equation and solving it using various strategies. In this method, learners break down larger numbers into smaller, more manageable parts. By systematically progressing through these three phases, learners developed a strong and flexible understanding of multiplication. The structure of this intervention was modeled on Hermann Brain Dominance Learning Model in which learning occurs at learners on pace,on his own development. This model is widely used in the creation of self learning materials, in which the learner will learn the lessons on his own time and effort

The primary objective of this research is to improve the multiplication skills of Grade five learners in multiplication through the Math-Simplex Method.

Specifically, this seeks to answer the following:

1. What is the multiplication skills of the grade five learners before and after their exposure to the intervention
2. Is there significant difference in the grade five learners' performance before and after their exposure to the intervention?
3. How effective is the intervention as perceived by the learners?

This study tried to answer the hypothesis there is no significant difference in the grade five learners' performance before and after their exposure to the intervention

Research Method

This research utilized a one group pre-test post test experimental design which suits this research as the primary goal is of this research is to find out the effect of the Individualized Math Bundle as a treatment on learning gaps by comparing the scores of the same respondents before and after the exposure. In this study only one group will be involved. A pre-experimental design using one-group pretest-posttest design will be used. In this design, a single case will be observed at two time points, one before the treatment and one after the treatment. No control or comparison group is employed. Likewise, ss this design is a type of quasi-experiment in which the outcome of interest is measured two times, once before and once after exposing a non-random group of learners to the intervention, this research design will be employed in three stages. First, administering a pretest measuring the dependent variable which is the computational ability of the grade one learners in addition. Second, the intervention will be employed among the respondents, and third, administering a post test, again measuring the dependent variable. 35 Grade 5-Carlos P. Gracia learners of St. Mary Village elementary School were the respondents. They are all struggling in performing multiplication and are heterogeneous in terms of gender, age, social economic status and academic performance.

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Instruments

To find out the learners' skills in multiplication before and after their exposure to intervention, the researcher will use test as one of the instruments. The researcher applied a set of tests: pre-test and post-test test. Both pre-test and post-test are 20 item multiplication tests gleamed and aligned to MELC competency 'Solves routine and non -routine problems involving multiplication of whole numbers including money using appropriate problem-solving strategies and tools. M4NS - Id -45.4 ". This was validated by the school LRMDS.

To find out the perception of the learners as how effective the intervention is, a researcher made survey instrument will be utilized. The survey will be composed of three domains, content of the intervention, usability and and suitability, with five indicators each domain with a total of ten indicators in all, with a four (4) point likert scale as (4) strongly agree, (3) agree, (2) disagree and 1 (strongly disagree). This will also be subject for the validation of the district research committee.

Research Ethics

The researchers strictly followed the DepEd Regional Memorandum No. 228, 2020 or the "Policy Guidelines on the Adherence to Ethical Research Principles Involving Teaching, Teaching-Related, Non-Teaching Personnel and Learners". Researchers are also aware on issues such as human rights, animal welfare, compliance with the law, conflicts of interest, safety, health standards and so on. The handling of these ethical issues greatly impacts the integrity of the research project and can affect whether or not the project receives funding (Center for Innovation in Research and Teaching, 2019). First, the researchers secured the permission of the school head prior to the submission of this proposal. There was a letter of intent sent to the school head stating the goal of this research. As the letter of intent was accepted, the researcher secured the permission of the parents to allow their children to be the participants of the study. The proponents gave emphasis that the participation of the respondents will be voluntary and the learners will never be forced to participate. After the conduct of the intervention, the researcher secured the confidentiality of the data and its safety from collection to storage, to its deletion. A secured storage such as google drive was prepared in which only the researcher can access it.

RESULT

Multiplication Skills of Grade 5 Learners Before and After the Intervention

The researcher used the descriptive statistics mean ,Percentage, Score (MPS) to determine the multiplication skills of Grade five learners before and after the intervention

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Table 1. Pre test and Post-Test Result

	Grade Level	No. of Cases	No.of Items	Mean	SD
Pre Test	5	35	20	7.65	1.674
Post-Test			20	18.68	3.672

The mean score 7.63 during pre test indicates that each learner answered about 9.63% out of 20 questions correctly before their exposure to intervention. This can be considered low because this is below 10 or below 50% of the total assessment. This result indicates that prior to the intervention, the average learners' multiplication skill was just approximately 38.25% level of proficiency which is significantly far beyond the passing level (75%). Also, this result implies a little variation in how well the learners performed, as some of them can multiply well while others are struggling. The standard deviation 1.74 indicates that each score is closely near to one another. The data points to a low range of prior knowledge or abilities among the pupils. The absence of a high frequency of scores grouped at the upper end suggests that a sizable percentage of the students performed poorly on the pre-test in terms of performing the competency . A need for differentiated instruction to meet the groups varied learning needs is indicated by the comparatively even distribution of scores across the lower and middle ranges. This observation of a lack of strong pre-existing knowledge is supported by the low mean score (as previously calculated). The findings of the pre-test demonstrate the necessity of focused interventions to address the varying comprehension levels and enhance overall performance. Similarly, Eugenio (2024) found out that during pre-assessment in reading, learners as a whole scored relatively low on the assessment, and that low MPS indicated various factors such as poor foundational skills in phoenics, affected their reading performance .

Meanwhile,the mean score during the post test 18.68 indicates an improved performance of the learners in multiplication. This means that, on average, each learner answered about 18.68 % out of 20 questions correctly during post test or nearly perfect score. The highest score was 20, and the lowest was 17, showing a range of scores amongst learners. It is noticeable that all of the learners passed during post test.This result indicates that after the intervention, the average learners' decoding skill was just approximately 93% level of proficiency which is significantly far above the passing level (75%). The standard deviation 3.672 however, shows variability of their scores, due to other factors .

The findings imply that learners' multiplication skills were generally enhanced by the intervention based on the result of pre test and post test being compaired. However, lower scores suggest that the intervention might not have had the same impact on every learner. Similar to the study of Egerhag,Selenius Fälth and Svensson (2023), all of their three participating students demonstrated weak performance on word decoding during baseline and improved their word decoding ability during the intervention resulting to higher post assessment result.

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Significant difference in the grade five learners' performance before and after their exposure to the intervention

Table 2. Normality Test of Result of Pre-Test and Post Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PreTest	.145	35	.200	.953	19	.446
PostTest	.346	35	.000*	.684	19	.000

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

First, the researcher tested the normality of the two sets of data. The pre-test and post test scores were tested using Kolmogorov-Sminov and Shapiro -Wik . Both tests assessed if the two sets of data follow a normal distribution.

The p-values for both the Kolmogorov-Smirnov (0.145, p-value = 0.200) and Shapiro-Wilk tests (0.953, p-value =0.446) for the Pre-Test are greater than the common alpha level of 0.05. This indicates that researchers failed to reject the null hypothesis, suggesting that the Pre-Test data does not significantly deviate from a normal distribution. Therefore, it was concluded that the Pre-Test scores are normally distributed. In contrast, the p-values for both the Kolmogorov-Smirnov (0.346, p-value =0.000) and Shapiro-Wilk tests (0.684, p-value=0.000) for the Post-Test are both less than 0.05. Thus, researchers rejected the null hypothesis, suggesting that the Post-Test data significantly deviates from a normal distribution. Therefore, the Post-Test scores are not normally distributed which need the use of non-parametric statistical methods for further analysis.

In general, pre test scores found to have normal sets of data, while post test scores are found to be non-normal using both tests. This result led the researchers to reject the hypothesis, after proving that there is a significant difference between the pre test and post test scores after the intervention. De Jesus (2024) found out the significant increase in level of comprehension of grade six learners after the implementation of reading comprehension program.

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Table 3. Significant Difference Between the Pre-Test and Post-Test Scores

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PreTest	19	3	9	5.74	1.661
PostTest	19	10	20	17.47	3.672
Valid N (listwise)	19				

Table 3 reveals the significant improvement of scores from pre test to post test . The mean score increased from 5.74 during pre test to 17.47 during post test indicating a positive effect of the intervention,while the increased in standard deviation (1.661 to 3.672) implies that the impact of the intervention towards each learner varies, perhaps depending on several factors. However,whether there is an increase in variability during post tests, the fact that there is a significant increase in their scores indicates that the intervention truly help the learners improve their multiplication skills .Similar to the study of Alonzo(2024), a significant difference between pre assessment and post assessment result was found out after the intervention

Table 4. The learners perception as to how effective is the intervention in terms of its content

Content (Nilalaman)	**Mean**	**Interpretation**
1. The contents of Math-Simplex are accurate and organized *(Maayos at tama ang nilalaman ng Math-Simplex)*	3.64	Highly Well Structured
2. The instructions/directions in Math-Simplex are accurate and suitable to the target activities (*May tama at angkop na panuto ang mga gawain sa Math-Simplex)*	3.73	Highly Well Structured
3. Activities are easy to follow (*Madaling sundin ang mga Gawain)*	2.84	Well Structured

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4. Math-Simplex has interesting and enjoyable contents. *(Kaaya -aya at nakaka engganyo ang mga nilalaman ng Math-Simplex)*	3.20	Well Structured
5. My multiplication knowledge increased after using the Math-Simplex (*Tumaas ang antas ng aking kaalaman sa paggamit ng Math-Simplex)*	3.82	Highly Well Structured
OVERALL MEAN	**3.45**	**Well Structured**

The content of Math-Simplex as perceived by the grade five learners, is well structured ,with an overall mean of 3.45. This indicates that Math-SimPlex content is organized in a clear,logical and coherent manner that facilitates learning and understanding in terms of multiplication competency.

Table 5. The learners perception as to how effective is the interventionin terms of its Suitability

Suitability **(Kaangkupan)**	**Mean**	**Interpretation**
1. Activities in Math-Simplex suit to my learning needs *Ang mga Gawain sa Math-Simplex ay angkop sa aking pangangailangan sa pagkatuto*	3.57	Highly Suitable
2. The objective of every activity in Math-SimPlex suits to address my learning needs *(Ang layunin ng bawat gawain sa Math Bundle ay angkop sa aking kakayahan)*	3.16	Suitable
3. Activities in Math Simplex are anchored to competency in MELC *(Ang mga gawain sa Math-Simplex ay naka-angkla sa MELC ng Math 4)*	3.23	Suitable
4. The materials used in Math-Simplex suit to its objectives (*Ang mga kagamitang ginamit sa Math Sim-Plex ay akma sa bawat layunin nito)*	3.61	Highly Suitable

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5. Math-Simplex has sufficient assessment enough to evaluate my learning progress in multiplication *(Ang mga pagtataya sa Math bundle ay sapat upang makita ang pag-unlad ng aking kasanayan sa multiplication)*	3.66	Highly Suitable
OVERALL MEAN	**3.46**	**Suitable**

The overall mean 3.46 indicates that Mat-Simplex is suitable to the learning needs of the learners. It implies that this intervention material was designed and tailored to meet the specific learning needs (multiplication proficiency), preferences and abilities of the learners, thus, accessible to all learners,including those with diverse abilities, background and learning styles.

Table 7. The learners perception as to how effective is the intervention in terms of its Usability

Usability (Gamit)	Mean	Interpretation
I can accomplish Math-Simplex materials anywhere, whether inside or outside the classroom *(Ang mga gawain sa Math-Simplex ay maaari kong sagutan sa loob man o labas ng silid-aralan)*	3.36	Usable
Math-Simplex sufficed my poor learning skills in multipication *(Natugunan ng Math-Simplex ang kakulangan ng aking kasananayan sa multiplication)*	3.32	Usable
Math Bundle improved my ability to do activities independently *(Nahasa ng Math-Simplex ang aking kakayahan sa pag-sagot sa mga gawain ng mag-isa)*	3.43	Usable
Math Bundle improved my study habit *(Hinubog ng Math-Simplex ang aking study habit)*	3.23	Usable
I can use Math-Simplex materials to other Math Competency *(Maaari kong gamitin ang mga kagamitan ng Math-Simplex para mapaunlad pa ang aking kasanayan sa iba pang Math competency)*	3.55	Highly Usable

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OVERALL MEAN	3.38	

Table 7 reveals the learners perception as to how effective is the intervention

in terms of its usability.The overall mean 3.38 indicates that in terms of the Math-Simplex Usability, it was perceived by the learners as Usable. This indicates that the intervention is designed in a way that is easy for learners to navigate, understand, and interact with. Usability is a key aspect of instructional design that focuses on creating materials that are user-friendly and effective in facilitating learning.

Summary of Findings

The mean score of 7.65 out of 20 item assessment (38.25%) reflects a low average level of decoding skill. This is significantly lower than the 75% passing score, showing a huge disparity in the students' reading ability. The large range of scores ranged from a high of 11 to a low of 3, reflecting a large difference in students' decoding capabilities.

The post-test result indicates that all the learners scored 18 and above on a 20 item assessment, implies a significant increase from the mean obtained during the pre-test. Most of the learners scored maximum marks (20/20), indicating an improved level of competence in multiplication skills. Although the majority scored exceptionally well, a degree of difference in scores continued to exist, suggesting that the effect of the intervention was not consistent across the students.

The rejection of hypothesis was evident by the result of the pre test scores, when tested in the Kolmorov-Smirnov test to compare the cumulative distriburion function to a normal distribution of scores, result showed the p-value 0.200, which is greater that 0.05 indicating that the pre test scores are normally distributed, while using the Shapiro Wik test, result showed the p-value of 0.446 which also indicating a normal distribution of scores. On the other hand, post test data ,after the Kolmorov-Smirnov Test , revealed the p-value 0.000 which is likely less that 0.05 , while the Shapiro -Wik test revealed the result of 0.000,also leass than 0.05 level of significance. These results indicates that post test scores are significantly not normally distributed ,which can be concluded that there is a significant improvement on learners' multiplication skills after the intervention.

The learners perceived the intervention as highly effective in terms of its content and highly helpful in general. Their higher scores in post test manifested on it.

Conclusion

The learners obtained low proficiency in multiplication during pre-test which indicates a need for structured innovation to improve their multiplication skills while the post-test result implies a significant increase from the mean obtained during the pre-test. Most of the learners scored maximum marks (20/20), indicating a good level of competece in decoding ability. Although the majority scored exceptionally well, a degree of difference in scores continued to exist, suggesting that the effect of the intervention was not consistent across the students.

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The rejection of hypothesis indicates a significant improvement from pre-test to post-test suggests that the intervention Math-Simplex was effective in improving their multiplication ability. However, the high variability in post-test scores may investigation could be due to several factors or other uncontrolled variables influencing post-test performance. Gedik (2022) similarly found out that the students' reading difficulties decreased after the implementation of repeated reading, paired reading, and word repetition techniques, while on the contrary, Hipolito (2024) accepted the hypothesis after the post assessment in 4Fs revealed no significant difference from pre-test scores after a school based feeding program was offered among the grade 4 respondents ,implying that the being fed of nutritious foods for three months does not guarantee academic improvement .

In terms of effectiveness of Math-Simplex content, it is highy stuctured, organized in a coherent and systematic way that enhances learning outcomes by promoting clarity, engagement, and numeracy improvement among learners. The structured presentation of content plays a crucial role in creating an effective and impactful learning experience. With regards to suitability, it is suitable to learning needs. Its designed met the specific requirements, preferences, and abilities of learners, enhanced their engagement, motivation, and learning outcomes. By addressing individual learning needs and providing tailored support, the material can create a more effective and personalized learning experience for learners. In addition, Math-Simplex is usable which designed with a focus on user experience, ease of use, and effectiveness in facilitating learning. By incorporating principles of usability into instructional design, teachers can create materials that are engaging, accessible, and user-friendly, ultimately enhancing the learning experience for learners

Recommendations

Math-Simplex is recommended to be implemented and experimented in various grades and settings wherein learners have similar numeracy difficulties. This wider utilization can offer other insights into how effective it could be and its flexibility in responding to different pedagogical situations. Teachers should be given intensified technical assistance to improve their ability to develop interventions such as ,to address learning needs of the learners. The school should intensify the collaboration with parents and other stakeholder to sustain intervention programs. Also, further studies with regards to the intervention or decoding skills of the learners using other parameters or variables should be conducted.

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