
Strategic Intervention Material: A Tool in Enhancing the Learners' Least Mastered Competencies in Mathematics at Villa Imelda Elementary School

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ABSTRACT: This study was conducted to investigate possible solutions to help improve the mathematics performance of the students and promote effective and efficient learning by teaching mathematics concepts through Strategic Intervention Material and taking into advantage the incorporation of technology in learning. Employing a mixed method research design, the study was conducted to the 12 bonafide pupils of Villa Imelda Elementary School. The study assessed the intervention's impact on their performance using statistical analysis methods such as one grouped pre-test and post-test design, mean and standard deviation, Kolmogorov-Smirnov test, t-test, Cohen's D and Thematic analysis. The findings showed a positive effect of the intervention, as evident in the significant increase in the post-test mean scores of the pupils from 6.5 to 13.42. This indicated that the intervention drastically improved the performance of the pupils, which had also resulted in a very large effect size with a computed eta squared of 5.94. These initial implications highlighted the promising impact of the Strategic Intervention Material and were effective in enhancing least mastered competency in mathematics. Feedback gathered indicated a significant increase in pupils' engagement and mastery in the lesson. Thus, it is recommended that educators should create and utilize similar contextualized learning intervention to improve students' learning outcome.

KEYWORDS: Strategic Intervention Material, Competency, Mathematics

I. INTRODUCTION

Mathematics is a foundational subject in education, essential for fostering problem-solving skills, logical reasoning, and analytical thinking. It serves as a universal language that bridges various disciplines, forming the backbone of advancements in science, technology, engineering, and mathematics (STEM). Despite its importance, mathematics often poses significant challenges for learners, with many struggling to achieve competency in fundamental concepts and skills. Addressing these challenges is critical for ensuring that learners develop the necessary mathematical proficiency to succeed academically and professionally. One promising approach to achieving this goal is the use of Strategic Intervention Materials (SIMs), which are designed to address learners' specific learning gaps and enhance their competencies in mathematics.

Mathematics competencies encompass a wide range of skills, including numerical operations, algebraic reasoning, geometric understanding, and data analysis. These competencies are essential for developing critical thinking and problem-solving abilities, which are vital for navigating real-world challenges. However, achieving competency in mathematics remains a persistent challenge for many learners, particularly in the Philippines.

The results of national and international assessments, such as the National Achievement Test (NAT) and the Trends in International Mathematics and Science Study (TIMSS), consistently indicate that Filipino students perform below proficiency levels in mathematics. For example, the TIMSS 2019 results revealed that the majority of Grade 4 students in the Philippines scored significantly lower than the international average, particularly in areas such as fractions, measurement, and problem-solving (Mullis et al., 2020). These findings highlight the urgent need for effective interventions to address learners' mathematical difficulties and improve their competencies.

Strategic Intervention Materials are innovative instructional tools that provide targeted support to learners who struggle with specific competencies. These materials are developed to supplement classroom instruction, offering learners additional resources to master difficult concepts. They are typically interactive, engaging, and contextualized, making them effective for addressing the diverse needs of students. In mathematics education, SIMs have been shown to improve learners' understanding, boost their confidence, and enhance their overall performance (Almario et al., 2019). This study explores the role of SIMs as a tool for enhancing learners' competencies in mathematics, with a particular focus on their impact in addressing common learning difficulties.

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Strategic Intervention Material (SIM) is an instructional material meant to re-teach concepts and topics which are considered least learned by the students who are working below national expectations but have the potential to meet national standards if given timely support and motivation (Dumigsi 2019). It is a teaching-learning kit devised for the benefit of both teachers and pupils. Its goals are to encourage pupils 'interest; learn Mathematics concepts and skills; and apply learned skills and concepts into real life situations. SIM is believed to be an effective strategic teaching aid for teachers in carrying out objectives on least learned lessons

Strategic Intervention Material, according to (Bunagan, 2012) tries to increase and deepen skills, knowledge and understanding from concrete to what is more abstract. It gave students the chance to explore their understanding and add up of those new ideas. Furthermore, an intervention material meant to recall the concepts and skills to assist and help the learners master a competency-based skill which they were not able to develop during classroom discussion. Dy (2011) also defined Strategic Intervention Material (SIM) as a teaching aid introduced into the teaching methods to stimulate the activity of the students and thereby increase their level of understanding.

The effectiveness of Strategic Intervention Materials can be understood through several educational theories. One key framework is Vygotsky's Zone of Proximal Development (ZPD), which emphasizes the importance of providing appropriate support to learners as they transition from what they can do independently to what they can achieve with guidance. SIMs act as scaffolding tools within the ZPD, offering structured assistance that helps learners gradually master challenging concepts (Vygotsky, 1978).

Another relevant theory is Gardner's Multiple Intelligences Theory, which highlights the need to address diverse learning styles. SIMs incorporate various instructional modalities, such as visual aids, hands-on activities, and verbal explanations, ensuring that learners with different strengths can benefit from the intervention (Gardner, 1993).

There are numerous studies conducted on the effectiveness of strategic intervention materials in mastering the competencies set by the Department of Education. The use of SIMs significantly contributed to the mastery of science concepts and also to the development of science process skills Alboruto (2017). According to Villonez (2018) the employment of SIM is better and effective than the use of traditional method in teaching some topic in science. In addition, Salviejo et al. (2014) found out that the use of Strategic Intervention Material is effective to improve students' performance and learning approach. The Strategic Intervention Material is effective as a remediation tool for students in solving problems in Mathematics (Dumigsi and Cabrella 2019) and help students easily master the least learned topics or competency (Herrera & Soriano 2016). Furthermore, Blalock (2010) described SIM as a competency-based academic support approach which will help students in upper elementary, middle high school, and higher education become independent and successful learner .

The primary objective of this research is to investigate the significant increase of Mathematics performance specifically in the enhancement of learners' least mastered competencies in mathematics through Strategic Intervention Materials . Additionally, the research aims to explore experiences and challenges of the respondents during the conduct of the intervention. By conducting this research, the researcher seeks to provide educators with evidence-based recommendations for implementing gamification strategies that maximize student engagement and learning outcomes in mathematics.

II. METHODOLOGY

The researcher made use of the mixed method of research wherein the collected data was treated statistically and thematically analysed aiming to understand the broad aspect of the intervention. Also, the research was conducted to get to know the situation in focus and used quantifiable instruments to analyse and understand the results.

Participants and/or other Sources of Data and Information

The participants were the twelve Grade 5 learners of Villa Imelda Elementary School. The main tool used to gather data relevant to this research was the administration of competency-based pre-test and post -test design. Class record was also be examined by the researcher to verify the test result.

Data Gathering Methods

The data gathering methods employed in the study was anchored to the research questions and data was gathered for interpretation. The researcher conducted a pretest which was composed of 15 questions to diagnose the level of performance of the target participants before the conduct of intervention. After commencing the pre-test, participants' scores were recorded and analysed. The researcher proceeded by administering the utilization of the intervention by respondents. A post-test was done and administered to see if there is a significant difference in the performance of the learners before and after the conduct of the intervention. Results of the pre-test and post-test was compared and analysed. Changes in the performance of the respondents was concluded as the result of the intervention. A structured interview questions was also used to collect responses from the students' experiences and challenges in the utilization of the intervention materials. Other related data was gathered and treated with the use of appropriate statistical tools

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Ethical Issues

To uphold ethical standard, the proponent followed the proper action research protocol where she sought permission and approval from the Division Office before the gathering of data needed. A waiver was also provided for the participants which was signed by their parents indicating their approval and consent for their children's involvement in the study. The results of the study were treated with confidentiality and was used for the purposed of the study only.

Data Analysis Plan

The following statistical treatments was used to analyze the needed data.

1. Mean and Standard Deviation – was used to determine the pre-test and post-test scores of the students in multiplying decimals.
2. Kolmogorov-Smirnov Test - was used to determine the normality of data that will be collected.
3. Dependent Samples T-test or Wilcoxon Test - was used to examine the differences in the pre-test and post-test scores of the students in multiplication of decimals before and after the implementation of gamification
4. Eta Square - was used to establish the effect size of the intervention. Eta square was interpreted using Cohen's guidelines:
5. Thematic Analysis – was used to analyse the responses in emerging experiences and challenges of the students during the conduct of the intervention

Cohen's d Score	Qualitative Description
0.20 and below	Small Effect
0.21-0.79	Moderate Effect
0.80 and above	Large Effect

III. RESULTS AND DISCUSSION

This section presents the analysis and interpretation of data obtained from the participants of the study.

Table 1 Learners' Score in Pre-test and Post-test in Conducting the Intervention

Intervention	Pre-test	Post-test
Mean Scores	1.68	1.16
Standard Deviation	6.5	13.42

Table 1 presents the mean scores of the pre-test before the conduct and post-test after the conduct of the project. The mean pre-test scores ($m=1.68$) with a standard deviation of 6.5, indicates the average performance of the participants before the intervention. While the mean post-test score ($m=1.16$) with a standard deviation of 13.42, represents their average performance after the intervention.

Based on the provided data, there is a positive effect of the intervention, with higher post-test scores and reduced in variability in performance. Furthermore, a decrease in standard deviation suggest that the post-test scores are more tightly clustered around the mean compared to the pre-test scores. This imply that there is more consistency in performance after the intervention.

As stated by Gul Malik (2019), comparing participants' post-test scores to their pre-test scores enables us to see whether the activity successfully increased participants' knowledge of the taught content.

High post-test scores compared to pre-test scores suggest that students were attentive to the lecture and were able to understand the key objectives of the lecture (Shivaraju, et al., 2010)

Table 2 Normality of the Pre-test and Post-test Scores

Performance	N	Mean	SD	p	Remarks
Pre-test	12	6.5	1.68	0.27	Normal
Pos-test	12	13.42	1.16	0.06	Normal

Table 2 disclose the normal distribution of the scores of the participants' pre-test and post-test scores in the conduct of the intervention. The results revealed that the probability values of p is greater than 0.05. hence, this indicates that the data is normally distributed.

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Table 3 Difference Between the Mean of Scores of the Participants' Pre-test and Post-test

Performance	t	df	p	Remarks	Decision
Pre-test					
vs	20.	1	<.00	Reject	Significa
Post-test	6	1	1	Null	nt
				Hypothesi	s

Table 3 presents the difference between the mean scores of the pre-test and post-test of the participants. The results revealed that the probability values of p are less than 0.05. Hence, the null hypothesis is rejected at 0.05 level of significance. Thus, there is a significant difference in the pre-test and post-test of the participants before and after the conduct of the intervention. This affirmed that the intervention was effective and that students know more than they did at the beginning of the instruction. Intervention strategies are excellent assistance to boost the academic performance of students. Furthermore, it is designed to uplift the standard of education (Garcia & Safadi, 2014)

Table 4 Effect Size of the Intervention

Performance	Means Scores	Difference Between Means	Eta Squared	Description Effect
Pre-test	6.5			
Post-test	13.42	6.92	5.94	Very Large

Table 4 reveals the effect size of the intervention on the performance of the participants. The data reflects the results of the performance before and after the participants' exposure to the intervention with a mean difference of 6.92 in favor of the performance after the intervention. The Cohen's D value of 5.94 attest that the improvement of the participants performance with the help of the intervention is Very Large. This signify that the intervention has immensely improved the performance of the participants and had a positive impact on how the participants comprehended the lesson. The result of the present study was in line with what Alde (2021) concluded that teacher made strategic intervention materials can help improve the academic performance of the students. As well as, incorporating these to the delivery of the lesson with the least mastery develops the retention and analytical skills of the students and helps in the transfer of learning.

Table 5 Experiences and Challenges of the Respondents in Using the Intervention

Themes	Description	f
Technical Issues	Difficulties in using digitized resources, technical glitches hindering their progress	9
Positive Engagement	Active and Enthusiastic participation of the students throughout the learning process	6
Time Constraints	Limitations and restrictions on the amount of time available for students to complete learning tasks.	7
Motivation	Extrinsic and Intrinsic motivation given by the teacher to boost students' performance	10

Table 5 shows the participants' responses on their experiences and challenges in using the intervention. As gleaned from the table, there were four (4) general themes recognized based on the short responses of the respondents via unstructured interview. The most frequent responses with a (f=10, 83%) imply that respondents are more interested in finishing their tasks and doing their work if the teacher keeps on motivating them. As shared by one of the students, "Ginagalingan ko lalo kapag sinasabihan ako ni ma'am na ang galing galing ko" (I strived harder every time my teacher tells me that I am very good). This is in connection with what Ani (2019) found out in her study that positive feedback shows a positive relationship with the students' physical and psychological learning outcomes. More specifically, it is advantageous in increasing students' motivation, confidence and self-efficacy and academic skills.

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Among the most frequent responses with a (f=9, 75%), dwells on the technical challenges during the research process. This includes the difficulties with using digitized materials and availability of resources used in online assessment and activity. As shared by one of the respondent, “Wala akong magamit na internet connection kasi wala kaming wifi ang gamit ko lang ay mobile data” (I do not have internet connection because we do not have wifi , I am just using mobile data). Providing good internet connection in the school for the use of good learning process via online should also be prioritized since the infuse of technology in the learning process is beneficial and can capture students’ interest. The use of technology in the classroom in the propoer manner has the benefit of helping to raise academic achievement (Courville, 2011). In the contrary, availability and distance of the school should also be considered.

Time constraints with a (f=7, 58%) was also evident among the students. A student directly expressed, “Kinukulang ako lagi sa oras sa pag sagot kasi iniintindi ko ng mabuti para hindi ako malito at masagot ko ng tama ang mga tanong pero buti na lang inaantay kami ni ma’am lagi para matapos namin” (The time was not always enough, because I am trying my best to comprehend the questions so I don’t get confused and I can answer it correctly but luckily my teacher always waits for us to finish). This highlights the importance of managing time effectively to ensure the successful completion of tasks.

A notable portion of the learners with a (f=6, 50%) expressed experiencing positive engagement during the research process. This vividly indicates that the conduct of the intervention and materials used were engaging, stimulating and have caught the students’ interests and focus. A student happily shared, “Nung itinuro ni ma’am ang lesson parang ang hirap pero nang gumamit kami ng modules ay ang dali lang pala ng lesson” (When my teacher taught us the lesson it seems hard but when she gave us the modules, I never thought that it was just so easy). This conclude that there is a high chance that students fail to grasp and comprehend some lessons and topics during class discussion which leads to least competencies. But with the utilization of competency-based strategic intervention materials can help the learners to develop the competencies that they did not master (Cordova, et al., 2019).

IV. CONCLUSION

Based on the finding, the following are the conclusions:

- The pre-test mean scores of the respondents before the implementation of the intervention is 6.5 while the post-test after the implementation of the intervention is 13.42. The low pre-test mean scores indicates that respondents have very low understanding of the topic discussed during regular class sessions and thus, resulted to low mastered competency.
- The pre-test and post-test scores were normally distributed as evident in the probability values of p is greater than 0.05.
- The post-test means scores revealed a significant difference improvement in the respondents’ pre-test means scores with a mean difference of 6.92. This suggest that after the implementation of the Strategic Intervention Material. least mastered competencies in Mathematics drastically improved.
- It is remarkable that the intervention yielded a highly substantial effect size of Very Large on the Grade 5 learners. This underscores the potency of the SIM in fostering profound comprehension among the learners in this specific competency.

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