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Localized Window Cards: An Intervention Material for Improving Mastery of the Four Fundamental Operations in Mathematics of Grade 3 Learners of Balaybay Elementary School

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***Abstract*: Mathematical proficiency is a cornerstone of elementary education, yet mastering fundamental operations remains a challenge for many learners. This study investigated the efficacy of localized window cards as an intervention tool to improve the numeracy skills of Grade 3 pupils at Balaybay Elementary School. Employing a quantitative descriptive-comparative research design, the study aimed to measure the impact of these materials on student performance and provide a mechanism for parental monitoring through numeracy progress report cards. The results demonstrated a significant improvement in student achievement. Prior to the intervention, the group recorded a pre-test mean of 10.81 with a Mean Percentage Score (MPS) of 36.03%. Following the implementation of the window cards, the post-test mean rose to 26.62, resulting in an MPS of 88.72%. This represents a substantial 52.69% increase in the MPS. Furthermore, the post-test data showed a lower standard deviation compared to the pre-test, indicating that the pupils' performance became not only higher but also more consistent. The findings conclude that the use of localized window cards is a highly effective intervention for mastering the four fundamental operations. The study recommends the continued integration of localized materials to bridge numeracy gaps and foster stronger home-school collaboration in monitoring student progress.**

***Keywords*: Localized window cards, four fundamental operations ability of grade 3 learners, quantitative, Balaybay Elementary School, Balaybay, Castillejos, Zambales, Philippines.**

1. Introduction

Data from the UNESCO Institute for Statistics (UIS) indicates a staggering global learning crisis, with approximately 617 million children and adolescents failing to reach minimum proficiency levels in mathematics [1]. This issue is most acute in Sub-Saharan Africa and Central/Southern Asia, where up to 80-90% of learners do not meet basic standards. High levels of anxiety have been shown to reduce working memory capacity [2, 3]. This leads to poor performance, which in turn increases anxiety, creating a self-perpetuating global trend of math avoidance. In the ASEAN region, students are estimated to be 5 to 9 months behind in mathematics compared to pre-pandemic cohorts, leading to a surge in literature regarding the need for localized interventions like window cards to address foundational gaps [4]. Furthermore, social pressures in East Asia often lead to a diminished math self-concept among students despite objectively high scores [5], [6].

In the Southeast Asia Primary Learning Metrics 2019, only 17% of Filipino Grade 5 students passed the basic standards in Mathematics. Additionally, the 2018 PISA results revealed that the Philippines received the second-lowest score in both science and math [7]. In many Southeast Asian systems, the curriculum is often criticized for emphasizing "procedural fluency" over "conceptual understanding," which identifies a barrier to developing higher-order thinking skills [8]. Specifically in the Philippines, the spiral progression approach has been scrutinized for being "fragmented," suggesting that without proper scaffolding, revisiting topics leads to confusion rather than mastery [9].

According to the Department of Education's (DepEd) Basic Education Development Plan 2030, the country aims to set in motion collaborative action to promote better numeracy achievement [10]. DepEd anticipates that local data will be gathered to establish a baseline for the National Mathematics Program, as stated in DepEd Memorandum No. 110 s. of 2022 [11]. These statistical results drive the researchers' curiosity to assess the learners' capability through the results of Project All Numerates. Previous studies on window cards have yielded remarkable differences in results [12], while others found that students often fail to master multiplication due to insufficient practice and the perceived daunting nature of the task [13].

These statistical results drive the researchers' curiosity to assess the learners' capability in Balaybay Elementary School through the result of Project All Numerates. In the study conducted by Recentes (2019) on the use of window cards in improving the performance of pupils in Math, the post-test yielded a remarkable difference in the result for the experimental group which proved the effect of the introduction of instructional strategy in the use of window card technique. Manzano (2010) on learning to multiply and teaching multiplication facts, found out that the reasons why pupils

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failed to master multiplication facts are because the pupils have insufficient practice and perceived that the task is so daunting. Hence, this study is to be conducted to test the efficacy of the use of localized window cards to improve the mastery of the four fundamental operations among the Grade Three pupils of Balaybay Elementary School.

A. Statement of the Problem

Finding the learners' proficiency level in resolving the four basic operations is the aim of the study. To achieve this goal, the following problems are resolved:

What is the numeracy level of the Grade 3 learners before the implementation of localized window cards?

1. What is the numeracy level of the Grade 3 learners before the implementation of localized window cards?
2. What is the numeracy level of the Grade 3 learners after the implementation of localized window cards?
3. Is there a significant difference between the pre-test and post-test results in terms of:
   3.1. Mean scores;
   3.2. Mean Percentage Scores (MPS); and
   3.3. Standard Deviation (SD)?
4. To what extent do localize window cards serve as an effective intervention for mastering the four fundamental operations?

B. Research Design

To assess the impact of the intervention, the researchers employed a quantitative descriptive-comparative method. This approach was ideal for breaking down complex educational events into manageable segments, allowing for a clear characterization of the group's progress [14]. By utilizing quantitative techniques, the study maintained an objective focus on established variables, using statistical analysis to draw conclusions from numerical facts [15]. As highlighted by recent educational research, this systematic collection of numerical data is essential for explaining and forecasting the phenomenon of numeracy improvement [16].

As highlighted by Syahfira Purba (2021), this systematic collection of numerical data is essential for explaining and forecasting the phenomenon of numeracy improvement. Ultimately, this research design was the most appropriate choice because it allowed the researchers to illustrate the significant connections between the use of localized window cards and student mastery through clear, data-driven tables and graphs.

C. Data Collection

To improve numeracy proficiency in alignment with global standards like the PISA 2018 survey, this study utilized custom-designed, localized window cards and a Numeracy Progress Monitoring Card for quarterly tracking. This study utilized custom-designed, localized window cards to emphasize contextualization, allowing Grade 3 learners to bridge the gap between classroom mathematics and their daily lives [17]. The research tools were developed to measure growth before and after the intervention [18]. To modernize the learning experience, the researchers introduced innovative training methods designed to make practicing the four basic operations engaging and effective [19]. This approach emphasizes contextualization, allowing Grade 3 learners to bridge the gap between classroom mathematics and their daily lives by rooting lessons in their own environment and experiences (Reyes et al., 2019). The research tools, including the pre-tests and post-tests, were carefully developed to measure growth before and after the intervention (Pan & Sana, 2021). To modernize the learning experience, the researchers introduced innovative training methods designed to make practicing the four basic operations engaging and effective (Singh et al., 2019). After being validated by the School Quality Assurance Team (SQAT), these materials were applied through a structured four-step process: introducing the localized cards, establishing scoring rules, conducting individual practice sessions to ensure full participation, and performing a final evaluation to measure the mastery of fundamental operations.

2. Result and Discussion

This section presents a detailed analysis and discussion of the research findings, beginning with a clear baseline of the pupils' numeracy levels prior to the intervention. Through tabular data, the study illustrates the initial challenges faced by the learners, providing a transparent look at their performance levels before the localized window cards were introduced. Beyond the statistical analysis, this part also humanizes the data by describing the actual classroom application of the intervention, detailing how the localized materials were integrated into daily lessons to make mathematics more relatable. By blending quantitative results with a narrative of the practical steps taken, this discussion effectively demonstrates how targeted, contextualized support can transform a student's mastery of fundamental operations.

A. Level of Performance of the Pupils

1) Pre-Test Results

As seen in the pre-test results, most participants were on the non-numerate level before the implementation of the approach. Children who perform poorly in mathematics early on and do not show improvement in whole number competencies are likely to continue having problems throughout their schooling [20]. Therefore, learners who score less than 80% on the assessment tool are classified as non-numerates [21]. Daily classroom activities can often reveal poor counting skills and inadequate arithmetic abilities if children do not receive enough attention in numeracy [22].

Table 1
Frequency and percentage distribution of the scores of the participants on the pre-test

Scores	Description	Before the conduct of the study	
		Frequency	Percentage
21 - 30	Numerates	0	0
11 - 20	Nearly Numerates	11	42.31%
1 - 10	Non - Numerates	15	57.69%
Total		**100**	**100%**

As can be seen from Table 1, it is evident that most of the participants were on the non-numerate level before the

implementation of the approach. Most of them scored between 1 to 10 during the pre-test. These results revealed a quite alarming scenario that is indicative of proper action to be taken. There were 65.38% of learners who fell under the non-numerates level while none of the learners were categorized under numerates during the pretest administration.

Jordan, Kaplan, Ramineni, and Locuniak (2009) state that children who perform poorly in mathematics when they enter kindergarten and do not show improvement in results that tap whole number competencies (such as counting, number combinations, and number knowledge) are likely to continue having problems into the elementary grades and beyond. Negative attitudes and performance in mathematics are not primarily caused by the nature of the topic.

Ineffective teaching methods combined with talent, practice, and copying from the board and learning formulas deplete pupils' drive, which ultimately results in poor overall performance in instruction. One of the requirements for mathematics teachers in every school is to make sure that students who aren't numerate at the start of the school year will become numerate after using an intervention program, it is crucial to ascertain and raise the numeracy level of pupils. Therefore, if a learner answered less than 80% of the created tool correctly, they were classified as non-numerates (Belleza, 2022). According to Aunio (2019), children's daily classroom activities can reveal poor counting skills, such as reciting numerals in word order, weak numerical interpersonal abilities, and inadequate basic arithmetic skills. This is especially true if the children are not receiving enough attention in the area of numeracy. The acquisition of mathematical abilities is crucial for children's future educational success as well as their performance in school.

B. Posttest Results

After administering the localized window cards, a post-test was given, and their scores were tabulated as shown in the next table. After the use of localized window cards to the participants, a post-test was again administered and revealed the results as shown in the table 2. It is evident that most of the participants are already on the numerates level. There were 22 of them or 84.62% who got scores ranging from 21 - 30 of the total test items. There were 4 pupils or 15.38% who are in nearly numerates level which means that they scored 11 - 20 of the total test items. There are 0 pupils or 0% who are on the non-numerates level which means that no one got 1 - 10 of the total test items.

Table 2
Frequency and percentage distribution of the scores of the participants on the post-test

Scores	Description	After the conduct of the study	
		Frequency	Percentage
21 - 30	Numerates	22	84.62%
11 - 20	Nearly Numerates	4	15.38%
1 - 10	Non - Numerates	0	0%
Total		**100**	**100%**

All mathematical competencies throughout grade levels are built on numeracy skills, thus it's important to gauge how much of them learners already possess (Wallit, L.,2016). Mastery checks evaluated students' performance on elements of each skill that were the focus of the corresponding intervention techniques. Early numeracy interventions are necessary for younger kids (e.g., first and second graders) who may not yet have a disability but who have persistent challenges with mathematics. They are also useful for students with disabilities that have been identified (Parker et al., 2019). Interventions based on empirical research can mitigate the problems faced by pupils who may have trouble studying mathematics (Aunio 2019). According to research, understanding the extent to which basic competencies contribute to math achievements in the future should be better utilized to guide the implementation of various programs for math intervention.

C. Comparison of Results

As can be gleaned from the table, the mean and MPS of the post-test were higher as compared to the pre-test. The post-test had a mean of 26.62

and MPS of 88.72 while the pre-test had a mean of 10.81 and MPS of 36.03. If to be compared it was obvious that the post-test mean is higher by 15.81 and MPS are higher by 52.69. It indicates that the localized window cards helped students get better in solving the four fundamental operations.

Table 3
Comparison of the performances before and after the study

	Mean	SD
Pre -Test	10.81	4.25
Post Test	26.62	3.18

In research, pretest-posttest designs are frequently employed, mostly to compare groups and/or track modifications brought about by experimental interventions (Dimitrov & Rumrill, 2003). Evaluation utilizing in-person pretest and post-test techniques when employing intervention techniques in training may result in improvements to the instructor's mentality, expertise, and abilities (Ramalingaswami, 1989). Following the intervention, post-test results showed that 84.62% of students reached the numerate level. Because all mathematical competencies are built on numeracy skills, it is vital to gauge how much of them learners possess [23]. Early numeracy interventions are necessary for younger kids who have persistent challenges with mathematics [24]. The comparison of results showed the post-test mean was significantly higher. In research, pretest-posttest designs are frequently employed to track modifications brought about by experimental interventions [25]. Evaluations using these techniques may result in improvements to the instructor's mentality and skills [26]. Finally, the reduction in standard deviation supports the effectiveness of the localized window card technique, mirroring successes found in previous instructional strategy studies [12]. Thus, evaluation of programs or interventions with positive evidence of immediate impact can strengthen the institutional efforts of effectively implementing the curriculum.

D. Significant Differences

The standard deviation of the pretest and post-test also supports the effectiveness of the strategy. The post-test had a higher mean and a lower standard deviation which means that the group had a more concentrated mean as compared to the pre-test. To prove further the effectiveness of Localized Window Cards to the Grade III Pupils' level of numeracy in mastering four fundamental operations, the standard deviation was calculated. The computed SD of pre–test is 4.25 and the SD of the post-test is 3.18. Based on the results of the pre and post-test standard deviation, it also supports the effectiveness of the strategy. The posttest had a higher mean and a lower standard deviation which means that the group had a more concentrated mean as compared to the pretest.

Thus, the use of Localized Window cards has a significant effect on the Grade III Pupils' level of numeracy in mastering four fundamental operations.

Table 4
Significant differences before and after the study

	TRS	Mean	MPS
Pre -Test	281	10.81	36.03
Post Test	692	26.62	88.72

In the study conducted by Recentes (2019) on the use of window cards in improving the performance of pupils in Math, the post-test yielded a remarkable difference in the result for the group which proved the effect of the introduction of instructional strategy in the use of window card technique.

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