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Effectiveness on the Utilization of Numeracy Station Materials in Improving the Performance of Grade 1 Pupils in Math

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Abstract — Learning to read, write and count is critical to a child's success in school and later in life and these are the most important skills that they should acquire at an early age. One of the best predictors of school success is the level of a child's progress in these foundational skills. Although reading, writing and numeracy abilities increase as children grow, the early childhood years, from birth to age eight, comprise the most important period for language, literacy, and numeracy development (DO #12, s. 2015). The ability to read, write and count does not develop naturally, or without careful planning and instruction. The availability and accessibility of age-appropriate and culturally sensitive materials for children are extremely important to encourage the regular practice of reading and counting (DO #12, s. 2015). Thus, it is necessary to provide the appropriate learning materials and activities to the pupils and these materials are mandated to be found in the numeracy stations in each of the classrooms for key stage 1 for utilization by the pupils during their numeracy lessons. Hence with the present scenario in the classroom during the opening of classes where most of the Key Stage 1 pupils have struggled in their numeracy performance. Thus, teachers had to craft intervention activities and materials to address the pressing problems in DepEd brought about by the pandemic and this is the reason why this study has come into being to evaluate the effectiveness of numeracy station materials in improving the performance of the Grade one pupils in Math. Employing the quasi-experimental research design using the pre-test and post-test performances and given the intervention materials and activities in the numeracy stations provided in this study, the data revealed a significant difference in the pre-test and post-test performances of the Grade 1 pupils before and after the utilization of numeracy station materials in teaching Math. Thus, the interactive, relevant, colorful and can be manipulated materials in the numeracy stations contribute to improving the numeracy performance of the Grade 1 pupils. Aside from these, independent working and managing their own activities to accomplish with accuracy were also developed while doing the tasks prepared by the researcher in each of the numeracy station at their own pace.

Keywords — Effectiveness, Utilization, Numeracy Station Materials, Improving, Performance, Grade 1 Pupils, Math

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I. Introduction

The development of early math skills happens mostly before first grade, which in school is considered the start of formal schooling and happens together with language and physical development (Harris & Petersen, 2019; Toll & Van Luit, 2013; Toll & Van Luit, 2014). Most young children learn these skills at home as a part of their daily life (Toll & Van Luit, 2013). As children learn to physically manipulate objects in the world around them, they begin developing basic math skills and vocabulary (Harris & Petersen, 2019). This can be as simple as sorting a set of toy dinosaurs by meat-eaters and plant-eaters or seeing how many steps it takes to get from the car into the living room. By talking about different attributes of dinosaurs or verbally counting steps one at a time, children and developing math skills. Toll and Van Luit's (2014) research shows that math and language skills and growth rate are interrelated and are an influence on each other. They found that language skills, specifically math academic language skills, are a prerequisite for early math skills (Toll & Van Luit, 2014). Children must be able to understand math vocabulary to complete basic math tasks. Math vocabulary starts simply with number names and positional words but later transitions into harder academic language such as addition, subtraction, multiplication, and division. Children do not learn math language without adult interaction. In fact, Harris, and Petersen (2019) found that children with more parent interactions related to math in early childhood are more likely to succeed in school overall. Children will not learn math vocabulary on their own. They need adults to introduce the words and connect the meaning to a physical interaction. For example, a young child can sort by color on their own but will not understand the words "sort" or "attributes" until they hear them from an adult and the words are used in connection with what they child is already doing.

Similarly, to early literacy and language development, early math development begins with academic vocabulary, extends to using that language in daily life and then translates into the ability to learn more complex skills (Harris & Petersen, 2019). As babies, children can distinguish between two small groups by noticing quantity, color, and size. By the toddler years, they enter the primary understanding stage and can count by pointing or touching and use number words to refer to quantities. The toddler years also include the acoustic counting and asynchrony stages where they can say number words as they count but may or may not say the numbers correctly in order. As children reach the preschool years around age four or five, they can quickly subitize groups to say how many and can count in order correctly, the synchronic stage. By Kindergarten age, children are in the resultative counting stage and can accurately count objects by only counting each object once, begin to add and subtract small quantities and understand that the last number said when counting is the total amount. Soon after, they enter the shortened counting stage and can identify numerals and count on from any given number (Aunio et al., 2015; Harris & Petersen, 2019).

The above activities must be developed by the child at a required age. These can be experienced by pupils whose parents are knowledgeable on the stages of child growth and

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development. Unfortunately, in the case of most of the pupils in the public schools where some of the parents are busy earning a living and have no time to investigate their children. They just rely on their supposed to be their responsibilities to the teachers knowing that educating their child is the sole responsibility of the teacher.

Moreover, as part of the learning recovery program of DepEd of which these grade 1 pupils have not experienced face-to-face classes during their kindergarten find difficulty in their numeracy skills. Thus, the DepEd started to create intervention programs to address the needs of the pupils. One of the interventions that the researcher decided to create being a Grade 1 teacher at the same time is to make the Early Language Literacy and Numeracy stations functional through the provision of numeracy station materials. These materials are manipulative toys, number stations, number books, number puzzles, mixed up numbers, number clip games, shapes, blocks, bottles, number match, number call out, fishing game on numbers, same and different numerals, popsicle sticks and other objects which can be used as counters, workbooks, learning activity sheets and audio-video lessons on numeracy. With the utilization of these materials in teaching and learning Math, the researcher believes that numeracy performance of the pupils will improve. And it is in this premise that the researcher decided to conduct this study to evaluate the effectiveness on the utilization of numeracy station materials in improving the performance of the Grade 1 pupils in Math. A proposed improvement plan was formulated based on the findings of the study. Moreover, it is in the rationale that the researcher who is currently a Grade 1 teacher in the above mentioned local, would like to delve worthy research undertaking that will benefit herself, the school she is currently teaching and that of her Graduate Program she is enrolled at.

This study evaluates the effectiveness on the utilization of numeracy station materials in improving the performance of Grade 1 pupils in Math in Casilda Elementary School of Merida District, Leyte Division for School Year 2022-2023. The findings of the study were the basis for the proposed improvement plan.

Specifically, this study sought to answer the following questions:

1. What is the pre-test performance of the Grade 1 pupils in Math before the utilization of numeracy station materials in teaching Math?
2. What is the post-test performance of the Grade 1 pupils in Math after the utilization of numeracy station materials in teaching Math?
3. Is there a significant difference in the pre-test and post-test performance of the Grade 1 pupils in Math before and after the utilization of numeracy station materials in teaching Math?
4. What improvement plan can be proposed based on the findings of this study?

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II. Methodology

Design. This study employed the quasi-experimental research design utilizing the pre-test and post-test to evaluate the effectiveness on the utilization of numeracy station materials in improving the performance of Grade 1 pupils in Math for School Year 2022-2023. Casilda Elementary School, Merida District, Leyte Division is the main locale of the study. The 35 Grade 1 pupils enrolled in the said locale for School Year 2022-2023 are the main respondents of the study. A researcher-made numeracy test which covers the addition and subtraction. This is in line with Regional Memorandum No. 280, series of 2021, Reiteration of Regional Memorandum No. 279, series 2019, the Institutionalization of the Conduct of the Unified Numeracy Test. This is a 20-item test questions of which addition and subtraction have 10-items respectively. This material is to test the numeracy performance of the Grade 1 pupils and their speed in answering such tests. This will be conducted before and after the utilization of learning numeracy station materials in teaching Math. Moreover, the researcher formulated lesson plans where integration on the utilization of numeracy station materials is highlighted. The numeracy station materials were formulated by the researcher to be utilized by the pupils individually during the teaching-learning process in Math. These materials were submitted to the District Math Coordinator and School Head for validation and quality assurance before it was given to the pupils for utilization. A matrix of activities was crafted to guide the teacher-researcher on the flow of his study. This research focused on evaluating the effectiveness on the utilization of literacy station materials in improving the performance of Grade 1 pupils in Math through the pre-test and post-test and its significant difference. A Proposed Improvement Plan based on the findings of the study is the output.

Sampling. There are 35 Grade 1 pupils involved in this study. Universal sampling technique is used in choosing the respondents of the study. Hence, face-to-face classes has already been implemented during the data gathering process, the research instruments were administered face-to-face with consent from the parents and Local IATF and strictly following the prescribed Health Protocol during the limited face-to-face classes.

Research Procedure. The researcher prepared the research design and tools utilized in the study. Approval and recommendation from the Panel of Examiner of the Graduate Studies was sought. A letter request to conduct this study was forwarded to the Office of the Schools Division Superintendent. Upon approval, permission from the District Supervisor and School Head was secured before the actual gathering of data. Orientation of the participants and administration of the pre-test was done face-to-face after the approval of the permit from the parents of the respondents. The tools used in the study were numeracy station materials, lesson plans, researcher-made numeracy test and matrix of activities. These tools underwent a series of validation by the experts like the District Math Coordinator, School, and District Head before it was given to the pupils. After the approval of the tools, these were reproduced as to the number of pupil-respondents. In the conduct of the pre-test, the researcher requested his fellow Grade 1 teacher to do the administration of the pre-test. After accomplishing the pre-test, intervention was given

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within four weeks. The implementation of the approved and checked lesson plans highlighting the utilization of the numeracy station materials was done in the duration of the data gathering process. After the four-week intervention, the post-test was administered. Results of the tests were collected. Data were tallied and submitted for statistical treatment. Analysis and Interpretation of Data. Making of Proposed Improvement Plan followed.

Ethical Issues. The researcher properly secured the permission to conduct the study from the authorities through written communication. In the formulation of the intervention materials that was used in the study, the use of offensive, discriminatory or other unacceptable language was avoided. The respondents' names and other personal data were not included in this study to protect their privacy. Participation of the respondents was also voluntary. Orientation was conducted for the respondents with their parents. In the orientation, issues and concerns were addressed and consent to be included in the study were signed. The researcher-maintained objectivity in analyzing and discussing the results. All authors whose works were mentioned in this study were properly quoted and was acknowledge in the reference.

Treatment of Data. The Simple Percentage was employed to evaluate result of the pre-test and post-test conducted before and after the utilization of the numeracy station materials in teaching Math. **t-Test of Mean Difference** was used to determine the significant difference in the pre-test and post-test conducted to the Grade 1 pupils before and after the utilization of numeracy station materials in teaching Math.

III. Results and Discussion

Table 1
Pre-Test Performance of Grade 1 Pupils in Math

Score Range	Description	PRETEST	
		Frequency	%
17-20	Excellent	0	0
13-16	Very Good	1	3
9-12	Good	16	45
5-8	Fair	15	43
0-4	Poor	3	9
Total		35	100
Weighted Mean		8.31	Fair

Table 1 presents the pre-test performance of the Grade 1 pupils in Math before the utilization of numeracy station materials. It was revealed on the table that among the 35 Grade one pupils 1 or 3% got a score of 13-16 which is interpreted as very good. This means that this pupil can already do the simple addition and subtraction of numbers. This implies that he/she has

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background knowledge on numeracy and that he/she needs enhancement activities to sustain or increase very good performance. Moreover, the table shows that there are 16 pupils or 45% got a score of 9-12 which is interpreted as good. This means that these pupils achieve almost 50% of the items. This implies that these pupils had acquired the basic knowledge in numeracy. They can add or subtract one digit number using their fingers and other counters. Further, the table shows that there are 15 Grade 1 pupils or 43% got a score of 5-8 which is interpreted as fair. This means that these pupils had acquired a minimal knowledge of basic numeracy skills and that teachers should give focus to these pupils in teaching Math. In addition, Grade 1 teachers should be sensitive enough to formulate intervention activities so that these pupils will not be left behind. Thus, additional learning support materials are needed to continually improve their performance in Math. Likewise, the table shows that there are 3 Grade 1 pupils or 9% got a score of 0-4 which is interpreted as poor. This means that these pupils need additional activities to help improve their knowledge of numeracy. This implies that these pupils need intervention activities and to be provided with interactive materials which will help them improve their performance in Math. Finally, the table revealed that the pre-test performance of the Grade 1 pupils before the utilization of numeracy station materials in teaching Math has a weighted mean of 8.31 which is interpreted as fair. The result of the pre-test means that the Grade 1 pupils need intervention materials and activities to help them address their needs. They need interactive and manipulative materials where they can involve themselves and interact with the materials to acquire the basic knowledge in numeracy and help them able to do the operation accurately. This implies that researchers should formulate activities which will involve all learners and help them experience interacting with the materials provided. Numeracy learning station materials are some of the examples of learning support materials which will help the pupils address their desired needs in learning Math. These numeracy station materials are manipulative and can be used by the pupils in learning Math lessons. Some of the numeracy station materials used in this study are blocks, counters, toys, dice, puzzles, Legos and other concrete or tangible materials which can be handled by the pupils and use it in their activities in Math.

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Table 2
Post-Test Performance of Grade 1 Pupils in Math

Score Range	Description	POST-TEST	
		Frequency	%
17-20	Excellent	33	94
13-16	Very Good	2	6
9-12	Good	0	0
5-8	Fair	0	0
0-4	Poor	0	0
Total		35	100
Weighted Mean		18.66	Excellent

Table 2 presents the post-test performance of the Grade 1 pupils after the utilization of numeracy station materials in teaching Math. It was revealed on the table that among the 35 grade one pupils, 33 or 94% got a score of 17-20 which is interpreted as excellent. This means that excellent performance was achieved by most of the grade 1 pupils after the utilization of numeracy station materials and activities. Pupils here were able to fully understand the concepts conveyed and they were already able to apply the knowledge gained using the learning materials provided by the researcher. These are the pupils who easily learn the lessons and can work independently while they are doing the activities in every station. This implies that the activities and materials provided in the different numeracy stations are effective and based on their needs and capabilities and helped them learn to answer basic numeracy test questions correctly. Moreover, the table also shows that there are 2 Grade 1 pupils or 6% got a score of 13-16 which is interpreted as very good. This means that numeracy skills were developed in this group of pupils. They were able to learn the basic concepts in Math. The activities and materials provided in the numeracy stations help them learn the best that they can and aid them in their needs to achieve positive learning outcomes. This implies that activities and materials in the numeracy stations suit the needs of the pupils and help the pupils create new knowledge and experiences and use them in accomplishing numeracy tasks. Constant visits to the numeracy stations and doing the activities provided can boost the confidence of the learners to strive and try to learn to do Math activities while at the same time playing with peers with learning. Finally, the table shows that the post-test performance of the Grade one pupils after the utilization of the numeracy station materials has a weighted mean of 18.66 which is interpreted as excellent. This means that after the utilization of numeracy station materials pupils were able to learn the basic concepts in Math. Since numeracy learning stations provided manipulative materials to the learners, each child had to work on the activities provided in the station at their own pace. They are learning alone because they were taught to work independently while they are in the station. This implies that pupils are responsible for their

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learning during center time and work with the materials to develop, discover, create, and learn a task at their own pace. The hands-on experiences in the different numeracy stations provide opportunities for pupils to remediate, enhance, or extend knowledge on a skill, concept, standard or topic, pursue interests and explore the world of knowledge, work at the level of need and be challenged, be creative and critical problem solvers, make choices, establish their own pace, and build persistence, manipulate a variety of different types of materials and facilitate complex thinking and dendritic growth (Kracl, 2012).

Table 3
Test of Difference Between the Scores in the Pre-Test and Post-Test of Grade 1 Pupils in Math

Aspects	Test Scores		Computed T	Critical T	Decision	Interpretation
Grade 1 Pupils	Pre Post	8.31 18.66	3.661	0.995	Reject H_o	Significant

Table 3 presents the test of difference between the scores in the pre-test and post-test of the Grade 1 pupils before and after the utilization of numeracy station materials in teaching Math. It was revealed on the table that the computed t of 3.661 is greater than the critical value of t which is 0.995, so null hypothesis is rejected. This means that there is a significant difference in the pre-test and post-test performances of the Grade 1 pupils before and after the utilization of numeracy station materials in teaching Math. The weighted mean in the pre-test of 8.31 has increased to 18.66 in the post-test after giving the intervention. The result of the study shows that utilization of numeracy station materials in the teaching-learning process aided the pupils to learn the lessons in Math and helped improve their numeracy performance. This implies that the materials found in the numeracy stations, if managed and used properly, helped the pupils learn the basic knowledge in Math and at the same motivates the pupils to learn more and achieve the best in their Mathematics journey. This implies further that utilization of numeracy station materials is effective in learning Mathematics skills among Grade 1 pupils. Teaching math skills in early childhood is important because it is during that time that children are the most open to learning. Early math and numeracy skills build on children's natural curiosity, inquiry, and exploration of the world around them (Chesloff, 2013; Harris & Petersen, 2019). Early math and numeracy are the general understanding of numbers and basic mathematical concepts (Harris & Petersen, 2019; Toll & Van Luit, 2014). These are skills such as counting, comparing, and contrasting, describing shapes and positions and problem solving (Aunio, Heiskari, Van Luit & Vuorio, 2015; Aubrey & Godfrey, 2003; Harris & Petersen, 2019; Ramani & Eason, 2015). Early math and numeracy skills are the building blocks of all future math classes. Without these skills, students will continue to struggle with higher math concepts.

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IV. Conclusion

The study revealed a significant difference in the pre-test and post-test performances of the Grade 1 pupils in Math before and after the utilization of numeracy station materials in the teaching and learning process. After being given a series of evaluations and interventions, pupils' Math performance has improved, showing that the activities and materials provided in the numeracy stations are effective. Thus, the interactive, relevant, colorful and can be manipulated materials in the numeracy stations contribute to improving the numeracy performance of the Grade 1 pupils. Aside from these, independent working and managing their own activities to accomplish with accuracy were also developed while doing the tasks prepared by the researcher in each of the numeracy station at their own pace.

V. Recommendations

1. The proposed improvement plan formulated should be utilized by the teachers to further test whether the intervention is effective to improve the reading performance of the Grade 1 pupils.
2. To find the usability of the materials as well as to maintain or increase the performance of the pupils, teachers should utilize the numeracy station materials and do the task provided in each station in teaching Math skills.
3. Teachers should implement and produce differentiated, relevant, and varied numeracy station materials which will be utilized by the pupils.
4. Teachers should provide differentiated learning activities and materials in teaching Math skills to help them understand the concept correctly and be able to apply the knowledge gained.
5. Teachers must attend training or LAC sessions on the construction of numeracy station materials and activities.
6. Teachers should religiously implement the Early Language Literacy and Numeracy Program through the institutionalization of ELLN corner and hub.
7. School Heads should allocate budget for the procurement of materials to be used in the production of numeracy learning materials which are prescribed in the numeracy stations.
8. School Heads should spearhead in the crafting of training design and LAC plan for trainings and LAC sessions for the improvement of teaching-learning process of teachers most especially in the improvement of learning resource materials in the numeracy stations.

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9. School Heads should provide technical assistance to teachers in terms of teaching numeracy skills, especially to key stage 1 classes.
10. School Heads should regularly monitor the teaching-learning process of teachers in the key stage 1 classes.
11. School Heads should maximize the time in providing appropriate technical assistance based on the needs of the teachers in teaching Math.
12. School Heads should submit the crafted numeracy station materials, activities, and lesson plans for quality assurance.
13. School Heads should encourage and provide technical assistance for the crafting of innovations and research based on the intervention provided to improve the performance of the pupils; and
14. Future researchers should replicate this study to include different locales and include different variables aside from the mentioned in this study.

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