

Emo-Stick-On: A Manipulative-Based Intervention Toward Enhanced Learner's Numeracy Level

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Abstract — The study aimed to determine the effect of manipulatives on grade five pupils' numeracy levels in Mayuro Elementary Schools, District of Rosario West, Schools Division of Batangas Province, by comparing numeracy levels before and after the intervention and determining the significant difference between the two groups. The study will employ the pre-experimental research methodology, namely the One Group Pretest and Posttest design with samples selected using the purposive sampling technique. To acquire data on students' numeracy levels, a researcher-created survey instrument in the form of a pretest, posttest validation, and underwent reliability test was conducted. The research will be based on Jerome Bruner's Hypothesis, which states that manipulatives are required when studying math to progress from one stage to the next. The study's findings demonstrate that pupils' numeracy levels were low before the intervention but improved afterward. It was also revealed that there is a change in the pupils' numeracy levels before and after the intervention, indicating that manipulatives such as “Emo-Stick-On” are beneficial. It is then suggested that the program be incorporated into the school heads' School Improvement Plan and budgeted for sustainability, as well as that the findings be shared with other schools to follow suit. The intervention will only benefit a few pupils categorized as weak or average in numeracy based on pretest results. The study is novel since it is the first time colored sticks have been used as an intervention. The study is comprehensive since the problem of numeracy is unavoidable and exists across multiple grade levels, and different schools; and a problem constantly being confronted given that new students are presented every year. Coming from a grade five level, their numeracy levels must be assessed and remedied before moving on to advanced lessons in arithmetic.

Keywords — *Math, Manipulatives, Numeracy Levels*

I. Introduction

Rationale

The pandemic has closed all schools in the world and even in the Philippines to protect the school children from contracting the virus. Several measures were also made in the Philippines to continue learning even at home (Tria, J. Z., 2020). Thus, they introduced the Learning Continuity Plan. Schools have chosen the manner of instructional delivery from among the many viable options such as TV and Radio Instruction, Modular and Online Distance Learning, and Blended Learning among others. Several problems have risen due to many factors. Primarily the problem has mostly been available within the Curriculum and Instructional delivery or the quality

management of the schools particularly, literacy and numeracy levels (Pokhrel, S., & Chhetri, R. (2021).

A handful of studies since last spring have used data from millions of students participating in computer-adaptive tests, such as the Northwest Evaluation Association's [MAP Growth test](#) and Illuminate Education's [FastBridge assessments](#), to estimate students' learning growth during school closures last spring compared to prior years, and project how much that rate of growth is likely to slow during 2020-21. The studies vary in how severe they gauge the so-called "COVID slide" to be, but all of them found on average, that students would lose more ground in math than in reading. Three studies based on NWEA data predicted students could learn half or [up to a full year less math](#) in 2020-21, compared to what they would learn in a typical year (Sawchuk, 2021).

In the District of Rosario West, Schools Division of Batangas, particularly in Mayuro Elementary School, we found out that there are students who are non- numerate based on their grade 5 average grade in Mathematics. With the help of the school Math teachers, the teacher-researcher made an innovation to augment the arising problem of the learners in numeracy. This innovation will lessen the teacher's burden since the researcher devised a manipulative (object designed so that a learner can perceive some mathematical concept by manipulating it) type of innovation.

A mathematical concept is introduced with manipulatives; students explore the concept using the manipulatives in purposeful activity. At the same time, the mathematical concept is represented using pictures of some sort to stand for the concrete objects (the manipulatives) of the previous stage; students demonstrate how they can both visualize and communicate the concept at a pictorial level. Mathematical Symbols (numerals, operation signs, etc.) are used to express the concept in symbolic language; students demonstrate their understanding of the mathematical concept using the language of mathematics. The use of manipulatives helped students hone their mathematical thinking skills. Manipulatives could be essential in helping students think and reason in more meaningful ways. By giving students concrete ways to compare and operate on quantities, such manipulatives as pattern blocks, tiles, and cubes have contributed to developing a well-grounded, interconnected understanding of mathematical ideas (Crowe, A., 2022).

The Intervention project "Emo-Stick-On" aims to help augment the students' problem towards numeracy level of selected Grades 5 pupils in Mayuro Elementary Schools in the District of Rosario West, Schools Division of Batangas Province. The intervention aims to strengthen the skills and knowledge of the students to solve mathematical problems through basic operations. Based on the Most Essential Learning Competencies of Grade 5 Mathematics, learning basic operations is the foundation.

Statement of the Problem

The study aimed to determine the effect of manipulatives' use on numeracy levels among the selected grade five pupils from Mayuro Elementary Schools, District of Rosario West, Schools Division of Batangas Province. Specifically, it would like to answer the following questions:

1. What is the numeracy level of the respondents based on the pre-assessment?
2. What is the effect of the Emo-Stick-On in the numeracy skills of the learners after the implementation based on the post-test?
3. What instructional program is proposed to strengthen the implementation of Emo-Stick-On?

Related Studies

A study by Rowly E. (2021) entitled the Effects of Math Manipulatives in the Classroom indicates that the use of manipulatives positively affects student learning in math classrooms. The usefulness of utilizing algebra tile manipulatives on Junior High School student performance in their work *The Use of Manipulatives in Mathematics Education*. The study's findings revealed that individuals who were taught substantial use of algebra tiles did significantly better. Thus, the usage of algebra tiles proved to be a very effective and promising approach to teaching and learning algebra, and the tiles also improved students' thinking processes while they solved algebra problems (Larbi, E. & Okyere, M., 2017).

II. Methodology

Participants and Other Sources of Data and Information

The study respondents were 40 selected bona fide Grade 5 learners from Mayuro Elementary School, District of Rosario West, Schools Division of Batangas Province. They were chosen based on their assessment as having below-average scores during the pre-assessment in mathematics in the First Quarter of School Year 2023-2024. Their poor proficiency in basic mathematical operations made them suitable participants for the study. The research study has used the purposive sampling method to achieve the desired quantity of respondents while maintaining the quality of characteristics required.

Data Collection Methods

The researcher used the Pre-experimental research design, particularly the One-Group Pretest and Posttest design. The one-group pretest-posttest design was a quasi-experiment in which the outcome of interest was measured two times: once before and once after exposing a nonrandom group of participants to a specific intervention/treatment (One-Group Pretest-Posttest

Design: An Introduction, 2022). In this case, the intervention was the Emo-Stick-On or the use of manipulatives, while the dependent variable was the student's numeracy level.

The Emo-Stick-On is novel since it is the first time colored sticks have been used as an intervention. Emo-Stick-On is learning material that pupils can understand systematic and predictable relationships between colored sticks and application. Teachers can help learners develop this understanding through hands-on activities and lots of fun activities in the form of sticks, visual arts, and puzzles that help learners explore the lesson and topics very interestingly and that can be used as a medium for basic math operations. This project will be done and test implementation in the school with the help of other teachers and parents. In making will take 15 days and 2 months for the testing and implementation on the pupils. This project will be evaluated by master teachers for its sustainability and validity.

The researcher had asked permission from the school head to conduct the study. After the permission was given, the survey instrument underwent the validity and reliability test. After validation, it was reproduced and administered before and following the intervention.

The respondent had answered a pretest and post-test standardized test before and after the intervention called RUNT (Regional Unified Numeracy Test), a 40-item Test that could be answered in 30 minutes covering four basic operations, namely Addition, Subtraction, Multiplication, and Division.

The researcher also gathered the respondents in clusters to conduct a structured interview through a Focal Group Discussion answering preset questions about lived experiences. Answers were recorded and transcribed for analysis.

Ethical Issues and Concerns

Names and other information were kept confidential. All actions taken were approved plan of action by the proper authorities. Sources of adapted statements were adequately acknowledged in the References section of the paper.

Statistical Data Analysis

The researcher used descriptive statistics and tests of significance. To determine the numeracy level, the mean was used and categorized into the following:

Table 1. Numeracy Level Scaling

Mean	Descriptive Equivalent
33-40	Outstanding
25-32	Very Satisfactory
17-24	Satisfactory
9-16	Poor
0-8	Needs Assistance

In determining the significant difference, a T-test was used. Meanwhile, Thematic Analysis was employed for problem number 5, determining the lived experiences.

III. Results and Discussion

This part includes a discussion of the results. The data presented in part follows the arrangement of the problems as set in the Action Research Questions.

Upon the administration and after the survey, the Pretest and post-test instrument tool, the collected data, and results of the Pretest and post-test were evaluated and analyzed.

Problem 1. What was the numeracy level of respondents before based on the pretest assessment?

Table 2. Numeracy Level of Respondents before the innovation

Indicators	MEAN	Descriptive Rating
Pretest Results	40	Poor

Table 2 shows the numeracy level as evidenced by the pretest results, which have a mean score of 40, described as poor.

This implies that when the grade five pupils are in the pretest, it can be abstract and/or contain too many unknown mathematical concepts, making it difficult for the grade five pupils to understand and giving them no direction, which resulted in the low performance of the 40-weighted mean and was described as poor.

Problem 2. What was the numeracy level of respondents after the intervention based on the pretest assessment?

Table 3. Numeracy Level of Respondents after the innovation

Indicators	MEAN	Descriptive Rating
Posttest Results	81	Outstanding

Table 3 shows the numeracy level as evidenced by the posttest results, which have a mean score of 81, described as outstanding.

This means when using emo-stick-on sessions, the pupils have improved achievement because the content area texts are organized in different ways and could easily be used, presented with manipulative activities and guidelines that are easy to use, and knowing those ways helps grade five pupils get the meaning and understand. With the use of this project, the grade five pupils were also motivated and interested since the method is a hands-on activity.

Problem 3. What instructional program is proposed to strengthen the implementation of Emo-Stick-on?

Three themes emerged as answers of respondents to these questions namely SIP or School Improvement Plan, LAC session, and Home Tutorial. The program as respondents reiterated must be incorporated into the School Improvement Plan so that it will no anymore struggle with seeking for the budget. It will have budget allocation and will continue to operate with SIP. Second, a LAC session for all instructors throughout the curriculum on how to implement and improve the Emo-Stick-On program will be held. Teachers and students will both be equipped. Second, home tutoring by instructors, as well as measuring the amount of work and time home teachers or parents put in their children, is not a strategy to enhance it. Because the child's follow-up is a mile long.

A proposed action plan is recommended below:

TABLE 4. Action Plan

Areas of Concern	Objectives	Strategies	Person Involved	Time Frame	Output
Governance	To incorporate in the School Improvement Plan to achieve sustainability	Endorse accomplishment or ACR to the School Head Meeting among school head and the SIP TWG Craft SIP with the inclusion of the program Have the printed copy approved in the Division Office	School Head SIP TWG Researcher/ Proponent	August 2024- April 2025	Approved copy of SIP
Curriculum and Instructional Delivery	To capacitate the parents and home school partners to do the sam strategy at home	Orient Parents thorough conducting a School PTA conference 2. Provide Home partners with materials Needed Monitor parent the conduct of the tutorial at home Provide technical assistance to parents Conduct Pretest and posttest	Parent Teacher Proponent Researcher Student	August 2024- April 2025	Minutes of the meeting or conference, MOA with the parents, Accomplished monitoring tool
Governance	To capacitate teachers to do	Conduct a LAC session	LAc Leader Math Department	August 2024- April 2025	LAC Meeting MOVS Minutes

	the Math-think-nique in face to face classes	Discuss the SWOT analysis of the program School Head Monitoring	Head, Math Teachers Tecahers from across curriculum, School Head		
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The instructional program is proposed to strengthen the implementation of Emo-Stick-On has much importance in the development of learners' intellectual abilities, and attainment of teaching and learning objectives cannot be overemphasized. The pupils taught with an effective program have excellent achievement scores compared with those taught without any intervention. It was also noted in the study that there is no significant interaction effect of treatment and motivation on pupils' achievement in math.

IV. Conclusion

The study aims to ascertain the impact of Emo-Stick-on on the respondent's numeracy levels. Results show that the student's math numeracy level is poor before and outstanding after the intervention. Project "Emo-Stick-On" is an effective intervention strategy to strengthen the skills and knowledge of the students to solve mathematical problems through basic operations. There is a significant difference between the numeracy level of students before and after the intervention.

V. Recommendations

The following actions to be taken should be highly recommended in order to further strengthen the program. Teachers must be encouraged to create engaging and experiential learning strategies to improve students' critical thinking skills and performance. Internal and external stakeholders must be capacitated about the newfound effective teaching strategy in the discipline and may be adapted to another discipline. LAC sessions must be conducted on implementing Emo-Stick-On and create an action and sustainability plan. Consequently, further research on this theme on another respondent, different locales of the study, and other disciplines, must be conducted.

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