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PROJECT LARO (Learning Arithmetic Using Real Objects): ENHANCING MATHEMATICS LEARNING THROUGH INTERACTIVE TEACHING STRATEGY

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ABSTRACT

This action research project aims to investigate the effectiveness of using manipulatives in the process of learning arithmetic. The study recognizes the potential of play as a powerful tool for engaging students and fostering a deep understanding of mathematical concepts. The research seeks to explore the impact of incorporating manipulatives into arithmetic instruction, examining how this approach can enhance student learning and academic achievement.

The project adopts a mixed-methods approach, combining qualitative and quantitative data collection methods. The qualitative component involves classroom observations, interviews, and student reflections, aiming to gain insights into students' experiences and attitudes towards using manipulatives during arithmetic lessons. The quantitative aspect employs pre- and post-assessments to measure changes in students' arithmetic skills and conceptual understanding after the introduction of manipulatives.

By implementing various manipulative materials, such as blocks, counters, and number lines, play and songs, the study intends to create an interactive and hands-on learning environment. This approach aims to facilitate students' active participation, exploration, and

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experimentation, ultimately promoting a deeper comprehension of arithmetic principles and operations.

The findings of this research project have the potential to contribute to the field of Mathematics education by highlighting the benefits of integrating manipulatives into arithmetic instruction. The outcomes will inform educators and curriculum developers about effective strategies to improve arithmetic learning outcomes and promote a positive attitude towards mathematics among students. Additionally, the study intends to provide valuable insights into the importance of play-based approaches in the teaching and learning of Mathematics, emphasizing the significance of engaging and enjoyable learning experiences for students' academic growth.

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I. CONTEXT AND RATIONALE

It cannot be overstated how important Mathematics is to practically every aspect of human growth. The foundation of all global technological development is Mathematics. Without proper and sufficient mathematical understanding, there can be no significant advancement in this contemporary technology period. Through the use of symbolism and the abstract depiction of phenomena, studying Mathematics improves one's comprehension of the world. Regardless of the study curriculum, it is a subject that is crucial for people to achieve academically. The use of arithmetic skills is prevalent across the majority of academic subjects.

But with the COVID-19 pandemic outbreak which has posed difficulties for the Philippine educational system at all educational levels in both the public and private sectors, numeracy rate among our learners have declined. The pedagogy used by the teachers and the students' capacity for learning are both strongly impacted by this difficulty. Teachers are confronted with a challenging situation as the pandemic spreads, making it difficult for them to blend in and provide pupils with a high-quality education. Teachers must confront and address large educational gaps after a full year of online and modular instruction. To name few of, reading, writing, learning math, and sentence construction.

Now, when the face-to-face classes resumed, one of the subjects that teachers struggle to teach is Mathematics. Even in the past, this subject was one of the most challenging

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and demanded a lot of work from both teachers and pupils. To teach this subject, textbooks, worksheets, and exams are typically used. Although these resources are crucial for improving arithmetic learning abilities, they do not promote retention or problem-solving abilities. It is not unexpected to learn that many students do not find Math to be enjoyable or fascinating, but rather find it to be tough, uninteresting, and irrelevant.

In order to increase both teaching and learning of the subject, it is essential to develop an engaging learning environment in math lessons. The utilization of a variety of instructional strategies that connect the subject matter, skills, and concepts will result in enhanced understanding and engagement as well as increased student confidence as math thinkers and learners. The issue is that, in order for kids to develop a solid foundation and comprehension of mathematical topics, they aren't always given the chance to explore and learn using arithmetic manipulatives. This research's goal is to examine the advantages of employing classroom manipulatives and how they affect students' academic attainment levels.

Teachers today need to come up with novel ideas and approaches to rekindle students' interest in learning. They need to instill in children the idea that learning can be interesting and fun, and that subjects like mathematics may really make learning more thrilling and enjoyable. In light of this situation, research on PROJECT LARO (Learning Arithmetic Using Real Objects) may be especially beneficial for students who are learning Mathematics with manipulatives. Children can do this to advance their understanding from the concrete to the

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abstract level. To facilitate the introduction of abstract symbols, teachers must, however, carefully select the activities and manipulatives they use. When a pupil may not understand the abstract Math process, manipulatives will give concrete understanding the concept behind the skill. When students develop a concrete understanding of math skills, then they are more likely to perform that Math skill and understand Math concepts at the abstract level. Manipulatives can make math concepts come alive.

The implementation of PROJECT LARO on Tomasa C. Pasia Memorial School will use manipulatives to explore and learn number concepts. This will be an important strategy in children's learning of Mathematics which, frequently, teachers do not see the benefit, nor do they want to take the time to let the students explore. Research shows that manipulatives are important to implement in the classroom because it helps with students learning in the Mathematics content area. This project will emphasize the importance of "contextual application in learning Math concepts, which is often referred to as "hands-on learning" using manipulatives, realistic word problems, and enticing and authentic challenges such as determining how many cubes it takes to measure a room.

The purpose of this study is to determine whether using real objects or manipulatives will have a bigger impact on the students. Students will be taught Mathematics in the first quarter in the conventional manner, then in the second quarter they will be taught using manipulatives. The researcher can determine whether students become more interested in learning about math

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through this, and by comparing the students' grades from the first and second quarters, the researcher may determine whether there has been an improvement.

II. INNOVATION, INTERVENTION, AND STRATEGY

The primary idea behind experiential education is that students' learning is improved when they obtain these through engaging in an active learning processes. Manipulatives can be crucial in delivering efficient, lively and interesting instruction in teaching Mathematics. It helps them learn by allowing them to move from concrete to abstract reasoning. Building on the learning theory work of Piaget and Bruner, a solid history of research supports the regular use of manipulatives in classroom mathematics instruction. While children can remember, for short periods of time, information taught through books and lectures, deep understanding, and the ability to apply learning to new situations requires conceptual understanding that is grounded in direct experience with concrete objects. It is also important to note the critical role of the teacher in helping students connect their manipulative experiences, through a variety of representations, to essential abstract mathematics. Together, excellent teachers and regular experiences with hands-on learning can provide students with powerful learning in mathematics. Manipulatives can provide valuable support for student learning when teachers interact over time with the students to help them build links between the object, the symbol, and the mathematical idea both represent.

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Manipulatives are concrete objects that can be viewed and physically handled by students in order to demonstrate or model abstract concepts. John van de Walle and his colleagues (2013) define a mathematical tool as, "any object, picture, or drawing that represents a concept or onto which the relationship for that concept can be imposed. Manipulatives are physical objects that students and teachers can use to illustrate and discover mathematical concepts, whether made specifically for mathematics (e.g., connecting cubes) or for other purposes. More recently, virtual manipulative tools are available for use in the classroom as well; these are treated in this document as a tool for teacher modeling and demonstration.

Children who learn mathematics through manipulative experiences are more likely to make the connection between their everyday world and the abstract world of mathematics. Students' early experiences and interactions with physical objects formed the basis for later learning at the abstract level. This type of hands-on learning is often referred to as constructivism, and is the basis for integrating math manipulatives into instructional math lessons. These foundation researchers provided guidance for the common use of math manipulatives in many math classrooms today.

This paper will build upon previous research that investigates how teachers use math manipulatives in their instructional lessons. Moyer (2004) states that some teachers use manipulatives in an effort to reform their teaching of Mathematics without reflecting on how the use of representations may change their own mathematics instruction. Baroody (1989) asserts

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that Piagetian theory does not state that students must operate on something concrete to construct meaning, although it does suggest that they should manipulate something familiar and reflect on these physical or mental actions. The actively engaged thinking is the component imperative to student learning. Ball (1992) posits that manipulative usage is widely accepted as an effective way to teach Mathematics, although there is little effort given toward helping teachers ensure their students make the correct connections between the materials and the underlying mathematical concepts.

Teachers need to learn how to encourage student exploration, related discussion, and reflection about the prospective math concept they teach. They need to be comfortable with students' exploration of the math concepts and possibly wandering off the "correct" track or even 21 challenging the teachers' own Mathematical viewpoint. Teachers cannot assume that when students use manipulatives they will automatically draw the correct conclusions from them. Adults may overestimate the power of manipulatives because they already understand the underlying Math concepts that are being conveyed by the math manipulatives. Teachers need to keep in mind that the student does not already possess this knowledge and still needs to make the correct connections between the manipulative and the underlying math concept. While math manipulatives are a valuable tool in the instruction of mathematics, teachers need to bridge the manipulatives to the representational and then abstract understanding in Mathematics so that

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students internalize their understanding. Just using manipulatives by themselves without this may not have great value.

Today, in an age of technology and high-stakes testing, teachers need to use and bridge the gap for students in using math manipulatives. This then can be connected to representational and abstract ideas in Mathematics to help students deeply understand the math they are learning and needing to apply to our everyday life. The utilization of educational materials helps students comprehend lessons more quickly. Their use aids students in learning new information, aids in helping new information stick in their memory, and improves performance. The ways in which the manipulatives are used spark interest in the students and encourage participation in the session.

Fundamentally, learning happens when students engage with their surroundings and have some experiences that lead to the discovery of correlations and connections between concepts. When instructors put their students at the center of their lessons, they are able to find new connections between the concepts they have been taught, and comprehension develops organically. The creative processes that mathematicians have enjoyed throughout the years and from which they were able to derive certain generalizations and principles should be made available to students as part of the teaching techniques.

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III. ACTION RESEARCH QUESTIONS

The main purpose of this research proposal is to develop strategies using manipulatives in teaching Mathematics and to identify its effectiveness among the Grade 6 pupils of Tomasa C. Pasia Memorial School. However, for its actualization, the following questions were proposed:

1. What are the difficulties of Grade 6 learners in learning Mathematics?
2. What are the strategies used in the implementation of the project that may have influenced the learners?
3. Is there significant difference in the achievement level of Grade 6 learners in Mathematics before and after the implementation of the project?
4. What program enhancement activities can be recommended for the benefit of the pupils?

IV. ACTION RESEARCH METHODS

A. Participants and/or other Sources of Data and Information

The respondents of the study were the Grade 6 pupils of Tomasa C. Pasia Memorial School for the school year 2022-2023. There were 27 pupils in the Grade 6 level, and all of them were included in the action research, thus complete enumeration method was used in order to collect the data needed.

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This group consist of 14 male and 13 female students. All of them were readers both in English and Filipino, and basically speaking, all of them were numerates. When it comes to academic achievement during the last school year, 11 of them garnered an average grade of 90-94, while the rest had an average grade of 89 below. With regards to their average grade in Mathematics the previous year, 11 of them got 90-94, 3 of them received 86-89 and the rest of the group obtained 85-80.

B. Data Gathering Methods

The instrument used to gather data were checklist which prompted the pupils to identify their learning difficulties in Mathematics.

A survey questionnaire was used to find out the extent to which these project help the pupils in their learning.

Records in Mathematics or their grades are also used. A paired T-test employed in order to determine whether the treatment actually has an effect on the population of interest, or whether two quarters are different from one another.

A one-on-one interview with the pupils was utilized in order to first-handedly obtain from the students the real effects of the project on them.

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C. Data Analysis Plan

This action research used descriptive mixed method research design. This study utilized the researcher made survey then later the data collection results were interpreted. This method was used to obtain a clearer picture from the quantitative data, and then to use the qualitative data to provide better understanding and explanation of the study in question. The researcher requested permission and approval from the School Head of Tomasa C. Pasia Memorial School to conduct the study. The researcher also gave permits to the parents of the pupils who underwent the study.

Upon the approval, the researcher distributed the checklist to the respondents. The 2nd quarter of this year, respondents are given different activities on manipulatives, interactive games and real-objects during discussions and lessons. By the end of the 2nd quarter, results were evaluated using their average grades in Mathematics for first and second quarter.

To substantiate and construct a meaningful interpretation and analysis of the study, the data were subjected to statistical treatment. Among the statistical treatments used are the following: frequency to determine the number of responses; weighted mean to get the average frequency of the responses in each weighted item and ranking which is applied to determine the importance of responses with the use of frequency count. The score of each questionnaire item was given corresponding weight value, with one as the lowest and three as the highest. Descriptive equivalents or verbal descriptions were also provided for the interpretation of results.

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VI. DISCUSSION OF RESULTS AND REFLECTION

Using interactive teaching techniques to improve math instruction is a potent strategy that encourages students' active participation and in-depth knowledge. Teachers can foster critical thinking, problem-solving abilities, and collaborative learning by using interactive aspects in their math lectures.

Use of manipulatives, which are actual things that students can handle and manipulate to learn mathematical ideas, is one efficient method. With the help of manipulatives, children may visualize and internalize complex mathematical concepts. Manipulatives give children the opportunity to actively engage in the learning process, making mathematics more concrete and approachable. Examples include utilizing blocks to understand geometric forms or counting beads to grasp numerical concepts.

1. Difficulties of Grade 6 learners in learning Mathematics.

The K to 12 Basic Education Curriculum in the Philippines, which serves as the national benchmark for educational standards, specifies the competency expectations for Grade 6 pupils. The Grade 6 competency standards cover a range of subjects, including science, math, English, Filipino, and social studies.

Students in Grade 6 are required to show proficiency in a variety of mathematical ideas and techniques. They must master the addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals, as well as other numerical operations. They should be able to use these procedures to resolve practical issues and make quick calculations in their heads.

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Competency	Number of Correct Responses	Percentage of Correct Responses	Remarks	Rank
Expresses one value as a fraction of another given their ratio and vice versa/Defines and illustrates the meaning of ratio and proportion using concrete or pictorial models.	20	74%	Moving towards mastery	3
Finds a missing term in a proportion (direct, inverse, and partitive).	21	78%	Moving towards mastery	1.5
Solves problems involving direct proportion, partitive proportion, and inverse proportion in different contexts such as distance, rate, and time using appropriate strategies and tools.	19	70%	Moving towards mastery	6.5
Finds the percentage or rate or percent in a given problem.	21	78%	Moving towards mastery	1.5
Solves percent problems such as percent of increase/decrease (discounts, original price, rate of discount, sale price, marked -up price), commission, sales tax, and simple interest	13	48%	Low mastery	8
Describes the exponent and the base in a number expressed in exponential notation.	19	70%	Moving towards mastery	6.5
Interprets and explains the Grouping, Exponent, Multiplication, Division, Addition, Subtraction	11	41%	Low mastery	10

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(GEMDAS) rule.				
Performs two or more different operations on whole numbers with or without exponents and grouping symbols.	20	74%	Moving towards mastery	3
Describe the set of integers and identify real -life situations that make use of it/ Compares integers with other numbers such as whole numbers, fractions, and decimals	12	44%	Low mastery	9
Compares and arranges integers on the number line.	20	74%	Moving towards mastery	3

With these numbers, it is shown that the results of their assessments before implementation, generally was low mastery and moving towards mastery. Among all the 10 competencies for first quarter, only 2 competencies got a score higher than 75%. These were finding percentage in a given problem and finding the missing term in a proportion. Lowest among the competencies were describing set of integers and identify real -life situations that make use of it/ Compares integers with other numbers such as whole numbers, fractions, and decimals, using GEMDAS rule and solving percent problems such as percent of increase/decrease (discounts, original price, rate of discount, sale price, marked -up price), commission, sales tax, and simple interest. The rest of the competencies stated about only reached 74% and below.

These figures represent that a gap is indeed present when it comes to learning Mathematics. With the use of manipulatives which will promote the development of problem-solving skills, these gaps could be addressed. Manipulatives provide a concrete representation of problems, enabling students to visualize and model mathematical situations. This visual and tactile experience helps students make connections, identify patterns, and apply problem-solving

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strategies. A study by Hiebert and Lefevre (2013) demonstrated that students who used manipulatives showed higher levels of problem-solving abilities and were more likely to use multiple strategies to solve complex problems.

2. Strategies used in the implementation of the project.

During the second quarter and the first week of PROJECT LARO's implementation with Grade 6 pupils, it was a quite different mathematics environment as their attention was focused on the materials (toys and manipulatives) they were holding. It took quite a few minutes before the teacher was able to regain their attention as some of the pupils were playing with the toys, treating them as regular toys and even throwing them around. At that moment, the pupils were still young and naturally inclined to spend time manipulating the toys.

The materials included big colorful balls, marbles of different sizes, small animal standees, tubes, cubes, Legos, and toy cars. For that week, the teacher began the lesson by introducing the different materials and manipulatives that would be used throughout the quarter. It was an unusual experience as the majority of the pupils paid attention and showed genuine interest in how they would be using these materials.

The lesson started with a review of fractions to provide a preview of the upcoming lesson on ratios. Clay was used for the pupils to visually represent the fractions being discussed. The teacher then asked the boys and girls to stand up and count from one until the last boy and girl were standing, respectively. This activity served as a basis for emphasizing the comparison of numbers, which was the topic of the day: ratios.

After playing the game "SIT UP and SIT DOWN," the pupils became aware that the first and second numbers in a ratio are vital in writing proper ratios. The teacher reinforced this concept using some of the toys used during the lesson.

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Dyads, or working in pairs, were also implemented during the discussion to encourage the pupils to share their learning and brainstorm with their classmates. Throughout the first week, manipulatives were used in every part of the lesson to introduce the idea that various objects can be utilized in their mathematics learning. The entire class remained engaged, even during the evaluation portion, where they were tasked with solving for the ratio of given numbers. In the following week, additional manipulatives were introduced for the pupils to use, including clothes clips, small car toys, ballpen lids, paper cups, bottle caps, cards, and even kinetic sand.

The topic for the second week was proportion and problem-solving that involved proportions, including the different types of proportion (direct, inverse, and partitive). For the review, a PowerPoint presentation was used for the pupils to identify whether the given ratios were proportions or not. During subsequent discussions, the teacher distributed manipulatives to each group and allowed them to use their own techniques to show the given percentages or rates. The teacher first introduced commonly used rates, such as 100%, 75%, 50%, and 25%, along with their corresponding fractions and decimal counterparts. During the evaluation phase, the teacher taught the pupils how to compute without using the manipulatives. This approach proved to be easier compared to direct instruction because the pupils already had prior knowledge of the topic.

Weeks 3 and 4 of the implementation were filled with excitement. The pupils eagerly anticipated the games, activities, and materials that would be used in every subject. The topic, which involved percentages, base, rate, and percent problems, posed a challenge. The teacher began the lesson by incorporating art activities, where the pupils were tasked with creating a percent triangle and hundred blocks. Through these activities, the pupils gained an idea of the day's topic. The hundred blocks used by the pupils were colored differently. Following this activity, the pupils worked in dyads to count how many blocks of each color were present. This was

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followed by a discussion, and later in the lesson, a group activity was conducted to further enhance their learning.

It is important to note that with the PROJECT LARO strategy, certain lessons may take 2-3 days to complete, ensuring that the competencies in the MELC are still met. Instead of rushing through all the competencies and resorting to rote learning, the emphasis was placed on ensuring that each topic was thoroughly learned and mastered before moving on to the next lesson.

Learning with a deeper understanding remains in the minds of the pupils for a longer period compared to short-term learning that fades quickly. As the lessons progressed, topics became more exciting and interesting, and many of them would continue to be relevant even until the pupils' college years.

In the last part of Quarter 2, from weeks 7-10, the lessons focused on comparing, arranging, and basic operations on integers. To tackle this complex topic, the activities included incorporating a song (Integer Song) before the lesson, an art activity of creating self-made integer rulers, and the use of counters. These activities further enabled the pupils to develop their understanding of integers.

After the implementation of the project, the result on the impact of the project are shown on the table below.

Competency	Average	Remarks	Rank
Expresses one value as a fraction of another given their ratio and vice versa/Defines and illustrates the meaning of ratio and proportion using concrete or pictorial models.	80%	Mastered	2
Finds a missing term in a proportion (direct,	80%	Mastered	2

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inverse, and partitive).			
Solves problems involving direct proportion, partitive proportion, and inverse proportion in different contexts such as distance, rate, and time using appropriate strategies and tools.	77%	Moving towards mastery	8
Finds the percentage or rate or percent in a given problem.	79%	Moving towards mastery	4.5
Solves percent problems such as percent of increase/decrease (discounts, original price, rate of discount, sale price, marked -up price), commission, sales tax, and simple interest	78%	Moving towards mastery	9
Describes the exponent and the base in a number expressed in exponential notation.	77%	Moving towards mastery	8
Interprets and explains the Grouping, Exponent, Multiplication, Division, Addition, Subtraction (GEMDAS) rule.	76%	Moving towards mastery	10
Performs two or more different operations on whole numbers with or without exponents and grouping symbols.	80%	Mastered	2
Describe the set of integers and identify real -life situations that make use of it/ Compares integers with other numbers such as whole numbers, fractions, and decimals	77%	Moving towards mastery	8
Compares and arranges integers on the number line.	79%	Moving towards mastery	4.5

These numbers show that the results of the implementation were overwhelmingly positive. The average of the class mostly reached 80% and the lowest average was 76%.

Students demonstrated improved understanding and performance in Mathematics as a result of the project learning arithmetic through play using manipulatives. Their engagement and

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enthusiasm for the subject increased, and they exhibited greater confidence in problem-solving and critical thinking. Parents also expressed satisfaction with the approach, noting the positive impact on their children's attitudes and abilities in mathematics. Overall, the implementation of the project yielded successful outcomes, enhancing students' learning experiences and fostering a favorable learning environment.

Based on one-on-one interviews conducted with the students, it is evident that the project of learning arithmetic through play, specifically through the use of manipulatives, has significantly improved their performance in mathematics. The students expressed their appreciation for the interactive and engaging nature of the lessons, which allowed them to grasp mathematical concepts with greater ease and enjoyment.

Through the use of manipulatives, the students were able to visualize abstract mathematical ideas and apply them to real-life situations. This hands-on approach fostered a deeper understanding of the subject matter and enhanced their problem-solving skills. The students felt more confident in tackling mathematical problems, as they were able to relate them to tangible objects and experiences.

Moreover, according to another Grade 6 pupil, the project encouraged them to collaborate and learn together with their peers. They students actively participated in discussions, worked together in pairs or groups, and shared their strategies and insights. This collaborative environment promoted a sense of camaraderie and support among the students, enabling them to learn from one another and build their mathematical competence collectively.

Overall, the project's focus on learning arithmetic through play and the use of manipulatives has proven to be highly effective in improving students' performance in math. By making mathematics enjoyable and accessible, the project has not only enhanced their academic achievement but also instilled a genuine interest and enthusiasm for the subject. The students'

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positive feedback highlights the importance of incorporating interactive teaching strategies that cater to different learning styles and create a dynamic learning experience.

3. Comparison of the achievement level of Grade 6 learners in Mathematics before and after the implementation of the project.

The table below shows the comparison between the mathematics performance of grade 6 learners with reference to their mathematical ability.

Group	N	Mean	Standard Deviation	P-value	Decision	Interpretation
1st Quarter	27	85.8519	4.97	6.6789	Reject H_o	Significantly Different
2nd Quarter	27	87.5185	4.39			

df = 26 *α = 0.05*

Results of the paired-t test indicated that there is a significant large difference between Before (M = 85.9, SD = 5) and After (M = 87.5, SD = 4.4), t (26) = 6.5, p < .001. Since the p-value < α, H0 is rejected. The After population's average is considered to be not equal to the Before population's average. In other words, the sample difference between the averages of After and Before is big enough to be statistically significant.

This only suggests that the implementation of Project LARO has significantly improve the performance of the grade 6 learners in Mathematics.

Based on one-on-one interviews conducted with parents, it is evident that the implementation of project learning arithmetic through play, specifically through the use of manipulatives, has received a highly positive response. Parents expressed their appreciation for

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the innovative approach to teaching mathematics, highlighting the noticeable improvement in their children's attitudes and performance in the subject.

Parents reported that their children have developed a newfound enthusiasm for mathematics. They noted that their children now eagerly look forward to math lessons, as they are engaging, interactive, and enjoyable. The use of manipulatives has made abstract mathematical concepts more tangible and accessible to their children, leading to a deeper understanding and retention of knowledge.

Moreover, parents observed that the project has enhanced their children's problem-solving skills. By actively engaging with manipulatives and applying them to real-life situations, their children have become more confident in tackling mathematical problems. Parents noticed an increase in their children's critical thinking abilities and their ability to approach problem-solving with creative and logical reasoning. Parents also emphasized the collaborative nature of the project.

They highlighted the positive impact of peer learning and group activities, which have not only fostered teamwork but also strengthened their children's communication and social skills. Parents appreciated the inclusive and supportive learning environment created through the project, where their children felt comfortable sharing ideas and learning from their peers. Overall, parents expressed their satisfaction with the implementation of project learning arithmetic through play and the use of manipulatives. They recognized the project's effectiveness in improving their children's mathematical skills, problem-solving abilities, and overall attitude towards the subject. The positive response from parents affirms the value of incorporating interactive teaching strategies that make learning enjoyable and relevant for students, while also nurturing important skills for their academic and personal development.

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4. Program Enhancement Activities.

The implementation of the project, focused on project-based learning and its positive impact on student learning outcomes, has been a significant undertaking. The project aimed to revolutionize the traditional teaching methods by incorporating interactive and engaging activities, such as the use of manipulatives, to enhance students' understanding and performance in mathematics. The positive impact of this implementation has been observed through increased student engagement, improved problem-solving skills, and a positive shift in attitudes towards math. However, despite these achievements, the implementation has encountered certain challenges that need to be addressed to ensure the sustained success of the program.

Throughout the implementation of the project, several challenges emerged that posed obstacles to its effectiveness. Some students initially struggled with the transition from a more traditional learning approach to a project-based one, requiring additional support and guidance to fully grasp the new learning methods. Limited access to necessary resources and materials, as well as logistical constraints, also hindered the smooth execution of the program. Moreover, variations in student learning abilities and diverse educational backgrounds presented challenges in tailoring the program to meet individual needs.

To address these challenges, the researcher came up with a program enhancement proposal below.

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Objectives	Activities	Persons Involved	Time Frame
Enhance student engagement in mathematics and promote active learning.	1. Introduce hands-on manipulative tasks 2. Conduct group problem-solving sessions 3. Implement project-based assignments	Teachers, students	First quarter of the year
Provide additional support to struggling students.	1. Identify students in need of support 2. Offer small group tutoring sessions 3. Provide individualized assistance	Teachers, support staff	Throughout the academic year
Ensure availability of resources and materials for effective implementation.	1. Procure necessary manipulatives 2. Organize and maintain resource library	School administrators	Prior to the start of the year
Provide professional development for teachers to enhance instructional strategies.	1. Conduct workshops on project-based learning approaches 2. Facilitate sharing of best practices	Teachers Trainers, teachers	Before the start of the year and ongoing throughout the academic year
Monitor and evaluate program effectiveness and identify areas for improvement.	1. Establish regular progress assessments 2. Analyze student performance data 3. Conduct student and parent feedback surveys	School administrators Teachers, administrators Students, parents	Ongoing throughout the year

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VII. ACTION PLAN

Research Output	Scheme of Dissemination	Resources Needed
Action research findings and recommendations for enhancing mathematics learning through interactive teaching strategy	1. Present research findings at educational conferences and seminars	Presentation materials (slides, handouts) Audiovisual equipment (projector, screen)
	2. Publish research paper in academic journals	Printing and publishing costs for research paper
	3. Share research results with colleagues and educational communities through online platforms	Online platforms (website, blog, social media)
	4. Conduct workshops and training sessions for teachers	Venue for workshops and training sessions
		Teaching materials and manipulatives
	5. Collaborate with local education authorities and schools to disseminate research findings	Networking with local educational authorities and schools

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