

Effectiveness of Play-Based Learning in the Performance of Grade 1 Learners in Mathematics

JENELYN R. ROJAS

Teacher I

Western Leyte College

Master of Arts in Education

Major in Elementary Education

rojasjen.fl8@gmail.com

Abstract — Games are an effective tool in education for quickening learning, teaching challenging material, and encouraging systemic thinking (Ding et al., 2018). Numbers, algebra, geometry, arithmetic, calculus, problem-solving, and mathematical topics in general are covered. Students, including those in early education, primary school, secondary school, and university, can gain mathematical knowledge and skills through game-based learning. One of the most effective learning strategies is active learning through gamification which allows the students to learn through playing games and using their classes more effectively. Thus, it is in this premise that the researcher decided to conduct this study to evaluate the effectiveness of play-based learning in enhancing the performance of Grade 1 learners in Math. A quasi-experimental research design was used through the conduct of pre-test and post-test to measure the significant difference of the performance. A researcher-made Math test in the 2nd quarter Most Essential Learning Competencies (MELCs) was used to evaluate the performances of the learners. Further, the researcher formulated lesson plans and learning activities with integration of play-based learning where learners will do the activities in a play while learning the concepts. Based on the data gathered, it was revealed that there is a significant difference in the performance of Grade 1 learners in Math before and after the integration of play-based learning. The dramatic increase in mean scores, coupled with the statistical rejection of the null hypothesis, supports that the improvement is not coincidental but a direct effect of the intervention. This proves that learning through play is a successful teaching method that boosts learners' motivation, comprehension, and problem-solving abilities in Math. Thus, the research justifies integrating interactive, experiential, and play-based methods in early childhood Math education.

Keywords — *Effectiveness, Play-Based Learning, Performance, Grade 1 Learners, Mathematics*

I. INTRODUCTION

Mathematics is one of the learning areas that must be taught at every level of education, especially in elementary school. Mastery of the mathematics concepts for every grade level is needed. Because mathematics subjects can equip learners with the ability to think logically, analytically, systematically, critically, and creatively and the ability to cooperate among groups. To achieve the desired mastery of the mathematics concepts, teachers were innovative in formulating and producing relevant learning activities which will guide the learners in achieving such goals.

Mathematics aims at the improvement of reasoning and logical cognitive abilities that enable individuals to solve numerical and mathematical problems. Every Businessman, Banker, Medical doctor, Laborers, Vendors requires mathematical abilities to fulfill the requirements of his everyday life. Mathematical knowledge and skills are also used in different fields such as Genetics, Physics and Chemistry that calculate various formulas (Morsanyi, McCormack, & O'Mahony, 2018).

One of the challenges in education is that in the education process, methods used that are not up-to-date, attractive, and does not promote deeper learning. There are several factors involved in students' learning and academic achievement, one of them is the teaching method. In the 21st century, the active teaching method may play a role in motivating, improving performance and academic achievement. However, due to inadequate resources, this teaching method is not used (Moalemi, 2019). Therefore, selective teaching methods of teachers must activate and dynamic students in their learning process to move towards learning themselves. One of the promising ways to achieve active participation of students in learning activities and increase their motivation is play-based learning.

Play-based learning enhances active learning and participation by providing students with the opportunity to solve problems in the context of play (Vankúš, 2021). In fact, some games and activities enhance children's learning more than any other book. Because games provide consistent feedback on student performance, they can be used to review knowledge and skills learned by students (Moalemi, 2019). According to research, courses such as experimental science, social studies, and literature have the flexibility to apply multiple teaching methods simultaneously and simply. However, the current presentation of mathematics in many elementary school classes relies on sequential descriptions of math concepts, followed by repetitive exercises and exercises to master specific content. This rigid structure makes math students see it as a chore to be completed, not a puzzle to be discovered (White and McCoy, 2019).

Mathematics is one of the most important basic courses during study, which unfortunately most students have difficulty with. Given that, mathematics is one of the subjects that is prerequisite for other subjects. Students' low scores in this subject leads to their failure in other subjects, which in turn makes them bored of Lessons and school. Teachers should look for ways to make this lesson attractive to students (Moradi and Maleki, 2015).

As a result, one of the most fascinating ways to learn is to teach math through play. This combination teaching method introduces students to math topics in the form of games and indirectly strengthens students' math skills. From another point of view, because the teaching methods used in schools are based on memory and only strengthen the memorization aspect of students, the vacancy of such teaching methods is strongly felt (Esmaili Gojar and Partners, 2017). For example, Vankúš (2021) stated that in the field of mathematics, appropriate games have been identified that promote mathematical achievements in various fields, such as problem-solving, algebra skills, strategic, reasoning skills, geometry, arithmetic skills, and facilitate critical thinking. In other words, moving away from inflexible teaching methods such as lecturing and problem solving can not only help change students' attitudes toward mathematics but can also change the way they look at themselves. Therefore, it is better for students to succeed in learning through exploratory, participatory and challenging processes (White and McCoy, 2019).

As grade 1 teacher, a need to make the teaching interactive where play becomes integral strategy to make it more meaningful and enjoyable. As such, this study was formulated to evaluate the effectiveness of play-based learning in the performance of grade 1 learners in Math. As mentioned, play-based learning where learners are facilitated to explore and engage with their environment and interact socially with others (Cornelli Sanderson, 2010; Zosh et al., 2018), and cooperative learning which involves the combined efforts of learners working together, children participate in 'real world' tasks which promote the development of deep levels of understanding (Biggs, 2011). Hence, most of the grade 1 teachers employ play-based learning in teaching Math. A proposed improvement plan will be formulated based on the findings of the study.

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 would benefit herself, the school she is currently teaching and that of her Graduate Program she is enrolled at.

This study evaluates the effectiveness of play-based learning in the performance of grade 1 learners in mathematics of Lim-ao Elementary School, Kananga III District, Leyte Division for School Year 2024-2025. 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 performance of the grade 1 learners in Mathematics before the utilization of play-based learning?

2. What is the performance of the grade 1 learners in Mathematics after the utilization of play-based learning?
3. Is there a significant difference in the performance of the grade 1 learners in Mathematics before and after the utilization of play-based learning?
4. What improvement plan can be proposed based on the findings of this study?

II. METHODOLOGY

Design. This study utilizes a quasi-experimental research design utilizing the pre-test and post-test to evaluate the effectiveness of play-based learning in the performance of grade 1 learners in mathematics. Lim-ao Elementary School, Kananga III District, Leyte Division is the main locale of the study. The school is situated in Barangay Lim-ao, Kananga, Leyte, approximately 11.5 kilometers from Kananga proper, and is easily accessible by various modes of land transportation. It is considered a medium-sized school in terms of both its facilities and student population and is led by a School Head. The faculty consists of three (3) Teacher I, one (1) Teacher II, twelve (12) Teacher III, and two (2) Master Teacher I, totaling 18 teaching staff members. It is where one of the geothermal plants in Leyte is located. The school is equipped with internet access, with the principal's office typically serving as the venue for teacher meetings. There is also a playground and a basketball court, where school programs and activities are often held. All classrooms are well-maintained by the teachers, and garbage bins are strategically placed throughout the campus to encourage students to maintain a clean and orderly environment. There are 32 Grade 1 learners involved in this study. The study utilized the researcher-made Math test in the 2nd quarter Most Essential Learning Competencies (MELCs). This is a 20-item multiple choice test with simple problem solving. The test will be conducted to the learners before and after the utilization of play-based learning in teaching Mathematics. Moreover, the researcher will formulate lesson plans play-based learning in teaching Math. Further, the researcher formulated learning materials and activities which use play-based learning in developing the lessons in Math particularly the 2nd quarter skills. The researcher-made tests, learning materials, activities and the lesson plans will be submitted to the District Math Coordinator and School Head for validation before it will be administered to the learners. A matrix of activities was provided by the researcher to keep track of the progress of the intervention provided.

Sampling. The respondents for this study were thirty-two (32) Grade 1 learners enrolled in the mentioned locale for School Year 2024-2025. The study employed complete enumeration in selecting the respondents.

Research Procedure. After the research was approved, data gathering commenced. Letter requests to conduct the study were submitted to the relevant authorities for approval. Initially, a request letter was sent to the Schools Division Superintendent to obtain approval for proceeding with data collection among the identified respondents. Following approval from the SDS, permission letters were also submitted to the Public Schools District Supervisor and the School Principal. Once approval was granted, the researcher proceeded with data collection. An orientation session was conducted for the respondents, and parental consent was obtained to include their children in the study. The pre-test was administered face-to-face during the Math period. Following the pre-test, a four-week intervention was implemented, focusing on teaching Math using play-based. Learning activities and resources were written in the plan as intervention activities. Learners were given tasks where they will play to find the answer. Post-intervention, a post-test was administered, and responses were collected, tabulated, and submitted for statistical analysis. A Matrix of Activities was prepared by the researcher to monitor the progress of data collection.

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 and activities 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 were acknowledged in the reference.

Treatment of Data. The quantitative responses underwent tallying and tabulation. Statistical treatment involved applying specific tools: Simple Percentage assessed the performance of Grade 1 learners in Math before and after integrating play-based activities into teaching. Additionally, the t-Test of Mean Difference analyzed significant differences in Grade 1 learners' Math performance pre- and post-implementation of play-based activities in teaching.

III. RESULTS AND DISCUSSION

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

Score Range	Description	PRETEST	
		Frequency	%
17-20	Excellent	0	0
13-16	Very Good	0	0
9-12	Good	10	31
5-8	Fair	15	47
1-4	Poor	7	22
Total		32	100
Weighted Mean		6.78	Fair

Table 1 shows Grade 1 students' Math performance before incorporating play-based learning, with scores grouped into varying ranges and the respective frequencies and percentages. None of the students scored in the "Excellent" or "Very Good" ranges (0% for both), but there are 10 students who belong in the "Good" range (9-12), representing 31% of the total. Fifteen students (47%) fell in the "Fair" range, which has the most significant number of students in this category, and seven students (22%) fell in the "Poor" range. The number of respondents is 32, which is 100% of the sample. The weighted mean score of 6.78 is in the "Fair" category, showing that the students had a basic but inadequate understanding of Math concepts before the intervention. This data emphasizes the need for intervention activities for the grade 1 learners to achieve their goals. The data contributing to the fair performance of grade 1 learners involves 10 learners (31%) who completed a good rating (9-12), suggesting that they had a moderate understanding of Math but still had areas for improvement. Fifteen learners (47%) were placed in the Fair category (5-8), indicating that nearly half had partial understanding but no confidence or mastery.

In addition, seven learners (22%) were in the Poor category (1-4), illustrating that a significant percentage struggled considerably with basic Math skills. The findings suggest that passive learning and rote memorization techniques were not successful, and there is a need for a more active, interactive approach to improve Math understanding. Working from the low pre-test scores, implementing play-based learning (e.g., Math games, manipulatives, authentic problem-solving) would enhance learners' motivation, participation, and conceptual understanding. The findings accentuate serious difficulties in Math performance by Grade 1 learners, where most learners could not achieve proficiency. The results affirm play-based learning as a teaching strategy since it can foster active learning, enhance understanding at the conceptual level, and boost learners' confidence in Math. By integrating hands-on and interactive teaching methods, instructors can help bridge the learning gap and build a better, more pleasant Math learning environment for young children.

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

Score Range	Description	POST TEST	
		Frequency	%
17-20	Excellent	16	50
13-16	Very Good	15	47
9-12	Good	1	3
5-8	Fair	0	0
0-4	Poor	0	0
Total		32	100
Weighted Mean		16.78	Excellent

Table 2 presents the Grade 1 Math learners' performance, broken down by ranges of scores, frequencies and percentages. Based on the data provided, there is an average weighted mean of 16.78, which already falls under the Excellent category and indicates a noticeable improvement from the pre-test score level of 6.78, which is a Fair category. In the "Excellent" range (17-20), 16 students reached this level, representing 50% of the sample, with mastery and confidence in Math principles. Fifteen students (47%) fell in the "Very Good" range (13-16), showing competence in the subject with little to be corrected, whereas one learner (3%) reached the "Good" score range (5-8) but still exhibited proficiency in Math. No students fell into the "Fair" or "Poor" levels (5-8 and 1-4, respectively). The number of respondents is kept constant at 32, equating to 100% of the sample. The change in student performance indicates that play-based learning enhanced motivation, made Math more fun, and promoted active engagement, resulting in better comprehension and confidence in problem-solving. The removal of students in the Fair and Poor levels attests to the fact that this method improved understanding, interest, and trust in Math. With these encouraging outcomes, play-based learning must be continued and increased to reap its full benefits in early childhood education.

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

Test Scores		Standard Deviation	Computed T	Critical T		Decision	Interpretation
Pre	6.78	3.27	9.68	3.5	5	Reject H ₀	Significant
Post	16.78			5			

Table 3 shows the outcome of the difference test between the pre-test and post-test performance of Grade 1 students in Math. It contrasts the mean scores before and after the intervention of play-based learning. The pre-test mean score was 6.78, whereas the post-test score significantly rose to 16.78. The calculated t-value was 9.68, higher than the critical t-value of 3.55 at a significance level of 0.05, hence rejecting the null hypothesis (H₀). This confirms a statistically significant improvement in Grade 1 learners' mathematical performance after the intervention. A standard deviation of 3.27 depicts a notable difference in the performance of Grade 1 learners in Math before and after incorporating play-based learning. The statistical findings indicate robust support for the effectiveness of learning through play in enhancing Math performance among Grade 1 learners. The increased mean scores and failure to accept the null hypothesis confirm that the intervention positively affected the learners' understanding and grasp of Math. These results indicate that play-based learning must be consistently applied, developed, and increased to promote continued academic development among young learners.

IV. CONCLUSION

The research findings show a considerable improvement in the mathematical performance of Grade 1 learners after the implementation of play-based learning. The dramatic increase in mean scores, coupled with the statistical rejection of the null hypothesis, supports that the improvement is not coincidental but a direct effect of the intervention. This proves that learning through play is a successful teaching method that boosts learners' motivation, comprehension, and problem-solving abilities in Math. Thus, the research justifies integrating interactive, experiential, and play-based methods in early childhood Math education. To maximize the benefits of play-based learning, educators should be trained in designing and implementing effective play-based Math activities. Schools should also invest in teaching materials and tools that support interactive learning.

V. RECOMMENDATIONS

1. Use the suggested improvement plan developed to aid the teachers in teaching the subject with tremendous enthusiasm, and learning will occur because of the activities brought forward while integrating the learning innovation.
2. Schools must implement play-based learning within math teaching to further learners' conceptual knowledge and problem-solving skills.
3. As the intervention greatly enhanced Math performance, comparable methods need to be tested on other areas of study like reading, science, and language to extend overall learning activities.
4. Teachers must be trained to develop and deliver play-based learning strategies to engage students maximally and ensure improved learning results.
5. Schools should invest in manipulatives, educational games, puzzles, and hands-on supplies to implement play-based learning interventions effectively.
6. Parents can be made to support Math principles at home through engaging games and practical application of mathematical proficiency, enhancing learning outside the class.
7. Schools should routinely review the impact of play-based learning approaches and adjust accordingly to increase student performance and participation.
8. Future researchers must conduct the same research in other places and other interventions or long-term approaches to check the impact.

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AUTHOR'S PROFILE



MS. JENELYN R. ROJAS

Jenelyn R. Rojas, born on October 26, 1991, in Kananga, Leyte. As a dedicated educator, she is passionate about fostering continuous learning and empowerment in her students. Her journey in education started at the National Heroes Institute, where she also completed my secondary education and later conducted my practice teaching. Jenelyn continued her academic journey at Visayas State University-Main Campus, where she earned her Bachelor of Elementary Education, in 2013, and passed the Licensure Examination for Teachers (LET) in 2014. Began her teaching career in the year of 2016.

Despite her financial challenges in supporting her sisters' education, Jenelyn has consistently pursued professional growth. Her commitment to lifelong learning motivated her to enroll in a Master of Arts in Education (MAEd) program with a focus on Elementary Education. She successfully completed the academic requirements for her MAEd in 2025, drawing on her diverse experiences and the support of various groups throughout her academic journey.

Currently, Jenelyn R. Rojas is a Grade 1 teacher at Lim-ao Elementary School. Her dedication to education, along with her diverse skills and community involvement, inspires both her students and colleagues. She is committed to making a meaningful impact in the field of education.