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# Play-based Strategy and its Effect on the Performance of Pupils in Mathematics

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## ABSTRACT

The purpose of this study was to determine the effects of play-based strategy on the performance of pupils in mathematics. Play-based strategy is one of the well-known methods used to teach mathematics at primary level. This method is applied to improve students' academic performance and learning behavior toward their success in learning mathematics. Moreover, this study determined the effectiveness of utilizing play-based strategy for young learners in one of the public schools in Magalang, Pampanga. A total of twenty third-grade students were purposefully selected as the respondents of this study. The approved questionnaire used for rating and evaluating students' performance was carefully examined and validated by three key experts in the field of elementary education. The findings revealed that the performance of the students significantly improved after the implementation of play-based strategy in learning mathematics as they excelled in their Learning Behavior, Academic Performance, Communication Skills, Collaborative Skills, Engagement and Participation, and Mastery of Learning. Based on the statistical results, the researchers concluded that there was a significant difference between the performance of the students before and after the implementation of the play-based approach. Therefore, the findings revealed that play-based strategy is highly effective in teaching mathematics to young learners.

## KEYWORDS

*Play-based, strategy, approach, academic performance, mathematics*

## I. Introduction

Play is a fundamental right of childhood and plays a vital role in children's physical, intellectual, and social growth (Encyclopedia on Early Childhood Development, 2023). It is a natural and enjoyable way for children to keep active, motivated and inspired in their daily activities (Bongiorno, 2023). According to Borst (2021), it is no secret that kids love to play. Children learn through play experiences, therefore—playing is learning and an excellent way to learn (Li & Mead, 2023). Also, it brings out teamwork, negotiation, and collaboration, as children share resources, exchange ideas, and play together (Richmond, 2023).

In daily living, mathematics is everywhere (Hom & Gordon, 2021). It became an essential part of humanity as it is used in a variety of contexts and one could not survive without it. It is applied to buy things, measure, tell the time, and so forth (Abalde & Oco, 2023). Mathematics is considered as the backbone of modern science and a remarkably efficient source of new concepts and tools to understand reality (Ebrahim, 2023). It is true as it involves real-world situations such as computing numbers, making decisions, and solving problems which enable students to transfer their learning out of the classroom and into their lives. These real-world contexts enable students to draw on existing funds of knowledge, transferring their background knowledge into the math classroom (Johnston, 2023).

Furthermore, young minds in the primary school level love to play while learning. It is statistically proven that they progress into mathematical operations because of their learning behaviors and thriving brains. They make connections with patterns and numbers, counting and adding, and these connections set them up for success in learning mathematics. Therefore, mathematics teachers need to make meaningful math lessons by implementing the play-based approach in order to meet the diverse needs of students and reach a high level of learning (Evans, 2021).

In 2023, the American Academy of Pediatrics (AAP) conducted a study showing that playing with children is a key factor in building thriving brains, bodies, and social bonds—all important in today's world. Their study shows that play can improve children's abilities to plan, organize, get along with others and regulate emotions in educational settings. Additionally, Oldridge (2019) concluded in his study that play creates open spaces for thinking and enhances students' language, arithmetic, and social skills, and even helps them cope with stress. Based on the study conducted by Evans (2021), play-based learning promotes students' engagement with materials in real-world scenarios and mathematical conversation with peers (p. 35). Zippert et al. (2019) also proved that children playing cooperatively with peers during mathematical activities demonstrates collaboration and allows for more effective problem-solving skills than playing independently. However, potential challenges of integrating play into mathematics education are highlighted in the studies of Nacional (2023) and Powers (2022), including the risk of creating extrinsic motivation, the perception of games as gimmicks and the need to ensure that playing activities align with the learning objectives. Yunianti (2019) considered that playing is the opposite of learning. It is represented, such as —"You have to finish your task before playing", which means that play can be done after finishing vital work. Other education systems have also reduced opportunities for playful learning and increased emphasis on didactic and traditional teaching approaches to learning due to the increasing issues of mathematics anxiety among learners (Parker & Thomsen, 2019).

In the Mathematics 3 curriculum guide posted on the official site of the Department of Education (DepEd), some of the tasks that Mathematics 3 learners have to accomplish under the K-12 curriculum are: a) to apply different operations (addition, subtraction, multiplication and division) of whole numbers involving money; and b) to apply knowledge of conversion of time, linear, mass and capacity measures and area of rectangle and square in mathematical

problems and real-life situations; however, most of them have computational weakness and incomplete mastery of number facts. They have the idea of how to simply compute numbers, but they find it hard to organize their thoughts in terms of mathematical problem-solving (Swinson, 2021).

In the recent result of scores of Filipino students' performance in mathematics released by the Program for International Student Assessment [PISA, 2023], the country remains among the world's weakest in mathematics. The PISA scores indicate that the Philippines scored below the global average in all categories, with its ranking improving only slightly, mainly surpassing countries that declined due to the pandemic's effects on student learning.Despite the Department of Education's (DepEd) firestorm of reforms and preparations, just less than a quarter of Filipino students who took the test in 2022 reached the minimum level of proficiency in mathematics.

The Philippines' implementation of an educational reform commonly known as K to 12 Program for holistic development and global competitiveness serves as an indicator for the country's performance in international large-scale assessments in mathematics (Balagtas et al., 2019). In the study of Bangcaya et al. (2021), results have presented that educational games engage learners from being alienated by conventional methods of classroom instruction. Their empirical study revealed that an educational strategy with the integration of playing games showed effective results. The findings showed that pupils who were exposed to playful activities scored significantly higher than the pupils in the conventional group. Therefore, utilizing a play-based teaching strategy helps students grasp mathematics more deeply and go beyond rote memorization in mathematical instruction. A playful and productive learner is hopeful and optimistic— elements of a mindset that helps students improve their understanding and academic performance in mathematics (Oldridge, 2019).

### *Research Problems*

Generally, this study aimed to determine the effects of utilizing Play-based Strategy on the Performance of Grade 3 pupils in Mathematics at a public school in Magalang, Pampanga in the academic year 2023-2024. Specifically, it sought to answer the following questions: 1) How may the performance of the students be assessed and rated before the implementation of play-based learning in Mathematics as perceived by: 1.1) teacher and 1.2) interrater?; 2) How may the performance of the students be assessed and rated after the implementation of play-based learning in Mathematics as perceived by: 2.1) teacher 2.2) interrater?; and 3) Is there a significant difference between the performance of the students before and after the implementation of play- based strategy in Mathematics as rated by: 3.1) teacher and 3.2) interrater?

### *Hypothesis*

There is no significant difference between the performance of the students before and after the implementation of play-based approach in Mathematics.

## I. Literature

### Play-based strategy as defined by the experts

A child-centered approach, play-based learning prioritizes the holistic development of children – nurturing their academic, social, and emotional growth. It recognizes that engaging and developmentally appropriate experiences are key to stimulating a child's interactions and abilities (Taylor & Boyer, 2019). Learning through play has become a vital strategy for boosting student engagement, focus, and the acquisition of essential skills (Parker et al., 2022). By weaving rich play experiences with curriculum goals, this methodology creates a multitude of positive impacts on students, fostering growth both academically and socio-emotionally (Jamie, 2023). In contemporary education, the use of play-based learning as a teaching and learning strategy is gaining prominence across all subject areas (Vankúš, 2021). Play is not just an activity; it's the very essence of childhood (Mardell et al., 2023). Through play, children naturally learn how to collaborate, negotiate rules and relationships, explore their imaginations, and develop crucial communication skills – all of which are fundamental to their social and emotional development (Lancehgs, 2024). This is corroborated by research, such as Shrivastava's (2023) study, which highlights the crucial role of effective communication skills in building a solid foundation for positive relationships with peers, teachers, and the broader school community. Students who possess strong communication skills are better positioned to contribute their ideas, collaborate effectively on projects, and navigate conflicts constructively, thereby contributing to a more positive and productive learning environment. These skills also empower them to forge connections, seek support when necessary, and cultivate a sense of belonging. The intrinsic link between play and learning is captured in the simple yet profound idea that "playing is learning" (Li & Mead, 2023). Unlike traditional teaching methods that often rely on rote memorization and repetitive drills, play-based approaches provide children with opportunities to engage in experiences that ignite their creativity, spark their curiosity, and hone their problem-solving abilities (Arhin, 2023). Conversely, a deficit in play-based learning can significantly hinder the development of critical social skills. Limited interaction with peers restricts a child's opportunities to practice turn-taking, sharing, effective communication, and the art of building relationships (Beuilby, 2023). It's important to acknowledge, however, that the concept of play is multifaceted and sometimes misunderstood. Society often mistakenly positions play as the opposite of learning, and the reality is that not all children intuitively know how to play effectively, nor do they automatically glean knowledge and skills from their play experiences (Yunianti, 2019). Children who are already grappling with social and emotional challenges may find it particularly difficult to initiate or sustain play (Shah, 2023).

Furthermore, the transition to formal schooling can be a source of anxiety for some young children. Weldon (2023) points out that even before entering formal education, a growing number of children report experiencing stress and fear surrounding mathematics, which can lead to increased avoidance of the subject and diminished numeracy competence. Traditional

mathematics instruction, frequently structured as a linear progression from counting to increasingly complex operations, may not align with how children naturally develop their mathematical thinking and understanding (Weldon, 2023). Teachers, as facilitators of play-based classrooms, have a critical role to play in understanding the diverse forms of play, creating inclusive environments where all children feel comfortable and supported, and skillfully guiding and extending children's play experiences to maximize learning potential (Jamie, 2023). Effective teachers are adept at building strong, positive relationships with their students within safe and respectful learning environments (Hawthorne, 2024). The integration of play-based teaching methodologies is not just beneficial; it's essential for improving student performance and fostering the development of crucial skills, particularly in subjects like mathematics (Vankúš, 2021). Recognizing its developmental significance, many classrooms are now actively incorporating play into their instructional practices (Burst, 2021). However, when play and learning are perceived as separate and distinct concepts, teachers may feel undue pressure to prioritize academic achievement and standardized test scores, potentially at the expense of effective play-based learning (Paterson, 2020).

Elementary mathematics teachers, in particular, often face the difficult task of balancing the demands of rigorous curriculum standards with the desire to implement play-based approaches in their classrooms (Moran et al., 2022). A significant factor contributing to the inconsistent implementation of play-based methodology is the wide range of differing and sometimes conflicting perspectives and personal beliefs about the nature of play and its true impact on early childhood pedagogy (Hilkemeijer, 2022). Finally, the evaluation of play-based learning presents unique challenges for educators, as the often dynamic and unstructured nature of play environments can make it difficult to systematically track and document evidence of learning (Ta, 2022).

**Academic performance of pupils in mathematics**

The findings validated by the Southeast Asia Primary Learning Metrics (SEA-PLM, 2019) reveal that merely 10% of students in the Philippines achieved the minimum reading standard, while 17% met the minimum mathematical standard expected by the conclusion of primary education. The performance of the Philippines in international mathematics assessments has been consistently subpar (Bernardo et al., 2022). As anticipated by the Department of Education (DepEd), there was no notable enhancement in the average mathematics scores of Filipino students, which remained significantly lower than those of their peers from other participating countries in the most recent Programme for International Student Assessment (PISA, 2022). In the realm of mathematics, the Philippines ranked second to last, surpassing only Guatemala, El Salvador, the Dominican Republic, Paraguay, and Cambodia, according to a global study conducted by the Organization for Economic Cooperation and Development (OECD, 2022). Specifically, only 18.5% of Filipino students achieved the minimum standard set in PISA 2018 (i.e., Level 2 or higher), while 26.9% were classified at Level 1 proficiency, and a substantial majority (54.6%) scored below the lowest proficiency Level 1, indicating a significant deficiency in mathematics skills (DepEd, 2020). Furthermore, Swinson (2021) demonstrated in his research that even if a child excels in other subjects, their performance in mathematics may begin to decline by the third grade.

In 2023, the Philippine Business for Education (PBEd) recognized the urgent need for comprehensive reform within the country's educational system. PBEd highlighted that, despite efforts to provide students with learning options that cater to their unique circumstances, around 25% of parents reported that their children are not receiving sufficient education due to insufficient resources, inadequate learning environments, and a shortage of teachers to accommodate the rising enrollment in public schools. The State of Education Report (2023) details the educational crisis and emphasizes the viewpoints of various stakeholders, including students, parents, educators, school administrators, government officials, and industry partners. It is crucial for schools and educators to identify students who may face challenges in mathematics early in the teaching process, to understand their specific needs and vulnerabilities, and to implement appropriate interventions to mitigate the risk of failure in mathematics (Bernardo et al., 2022).

In contemporary education, particularly in the 21st century, educators face increasing difficulties in fostering an engaging and effective learning atmosphere for young students. Asemani (2022) posits that one viable approach to address this challenge is the incorporation of diverse educational games, which can significantly enhance students' academic performance. Traditionally, many individuals perceive learning as the acquisition of specific skills, such as alphabet recognition, counting, and writing. There is a common misconception that play serves merely as a recreational activity devoid of educational value (Li, 2023). However, when implemented thoughtfully, a play-based approach can significantly enrich the educational experiences of all learners (Jamie, 2023). Supporting this perspective, Sakib (2019) found that children engage in dynamic and stimulating learning activities that align with their individual interests and needs through play-based methods. This approach not only improves academic outcomes but also positively influences students' learning behaviors, contributing to their physical, social, emotional, language, and cognitive growth (Derman et al., 2020). In summary, Noor et al. (2022) assert that students' learning behaviors are instrumental in understanding and regulating emotions, fostering positive relationships, and making informed decisions

Furthermore, the research conducted by Mardell et al. (2023) clearly demonstrates the benefits and positive outcomes associated with the incorporation of play-based strategies in the education of young children. In contrast, other scholars have pointed out the complexities involved in defining play, as societal perceptions often regard it as antithetical to learning. Additionally, not all children possess the skills necessary for engaging in play, and some may find it challenging to initiate or maintain play activities, which can hinder their development of knowledge and skills (Weldon et al., 2023). Similarly, Swinson (2021) found that despite a child's success in other academic areas, there can be a decline in math performance as they progress into third grade.

Based on the analysis of prior studies and findings, there is a lack of research on the effectiveness of play-based strategies in teaching mathematics to grade 3 pupils in the Philippines. This research aims to enhance the understanding of definition, impacts, and

successful application of play-based teaching strategies in mathematics education. It will also examine the importance of various resources such as educators, instructional materials, and the learning environment utilized to attain the desired learning outcomes for third-grade students' play experiences. Furthermore, the study seeks to identify and assess the critical need for data by analyzing the relevance of students' profiles in relation to their academic performance in mathematics.

## II. Research Methods

This study employed a quantitative research design. According to Wilson (2021), it is predicated on gathering and evaluating numerical data that is pertinent to strategy planning, implementation, and execution through surveys, tests, and organized observations.

This method is used to give precise measurements, statistical analysis, and the identification of trends, patterns, and correlations between variables, claims Kharbach (2024). In order to facilitate data collection and ensure the correctness and objectivity of the findings, this study employed a criterion checklist with a Likert scale (Bloomfield & Fisher, 2019). The researchers thoroughly reviewed and developed the checklist in order to collect adequate and clear evidence regarding the impact of play-based strategies on students' mathematical ability.

A quasi-experimental design was used in this investigation. Lauren Thomas (2020) states that the goal of this research design is to demonstrate a cause-and-effect link between an independent and dependent variable. This closely relates to the study's objective of determining whether or not third-grade children' mathematics ability was significantly impacted by a play-based teaching approach. The researchers conducted experiments by closely analyzing the learning behaviors, performance, and student-teacher relationships of grade 3 pupils in the classroom before and after implementing a play-based strategy.

### *Respondents*

The survey was conducted in the fourth quarter of the academic year 2023–2024 with third-grade students from a public school in Magalang, Pampanga. Out of the 20 kids in a part, the researchers chose 10 boys and 10 girls at random. The selection of the samples was done so that every individual in the population had an equal probability of getting chosen. A selection of participants was chosen at random from a population using a sampling approach called simple random sampling (Thomas, 2023). Additionally, children at this age and grade level showed a strong balance between cognitive development and imaginative play skills. They are also more self-reliant and have the ability to use play to convey their ideas and experiences. Additionally, according to Classbuk (2023), through interactive and play-based mathematics lessons, third-graders enhance their verbal and nonverbal communication, teamwork, empathy, problem-solving, and conflict-management abilities.

### *Instruments*

A criterion checklist for structured observations was employed by the researchers to evaluate the grade 3 students' academic performance in mathematics both before and after

the application of the play-based technique. Using a 4-point Likert scale, the checklist was used to assess students' performance and exerted learning behaviors both before and during the use of play-based strategies in their mathematics lessons. It was validated by the Department Chair of the Bachelor of Elementary Education at Pampanga State Agricultural University (PSAU) and two elementary math teachers in Magalang, Pampanga, under the direction of Department of Education Region III. The indicator frequency level was displayed on the scale by choosing a suitable equivalency, such as never (1), sometimes (2), often (3), and always (4).

There are two components to the checklist that is utilized both before and after the play-based method is put into practice. The first section focused on students' academic performance and learning habits according to their sex (boys and girls). Two criteria were used to classify this section: 1) academic performance and 2) learning behavior. Twelve (12) indicators make up the first criterion, learning behavior, which includes the following: working quietly; using academic noise; using appropriate language and good manners; being motivated to learn; paying attention at all times; making eye contact with the teacher; listening to the teacher while speaking; being warned by the teacher for inappropriate behavior or behaviors; being a good listener; being disciplined in class; feeling at ease in their learning environment; and raising their hand before responding. The second criterion, academic performance, included seventeen (17) indicators: easy-to-follow instructions and rules; interest in the subject; focus and staying on task; time management in completing tasks and activities; appropriate use of learning materials; participation in activity sessions; motivation and activity during learning; disciplined work; staying in the designated area; ability to relate lessons to real-life situations; manipulation and exploration of learning materials; practice self-control; best performance with others; best performance alone (individually); consistency of active participation; and energy from the start of the lesson until the end.

The second section, which is divided into four categories, including 1) Communication skills, 2) Collaborative abilities, 3) Engagement and Participation, and 4) Mastery of Learning, represents the students' overall academic performance. Two (2) indications were discussed under the first criterion, communication skills: effective communication with peers and effective communication with teachers. Two (2) signs are also included in the second criterion, collaborative skills: peer participation and empathetic and interested questioning of classmates regarding the lesson. Additionally, there are three indicators for the third criterion, Engagement and Participation: actively participating during the entire session; having a strong desire to learn; and feeling happy and content while learning. The final criterion, Mastery of Learning, comprises four (4) indicators: being easy to follow in discussions and lessons; applying critical thinking skills to solve problems; excelling and achieving high scores in mathematical activities; and connecting lessons to real-life situations.

Following the teacher and interrater's perceptions of the structured observation, the researchers used the weighted mean to evaluate the data and determine the average of all the outcomes. According to Hayes (2023), the formula for expressing it is mean = (sum of observation results) ÷ (total number of observation results).

The statistician and the researchers established a set of mean and p-value criteria for the results. The following equivalency in data interpretation is indicated by the mean criteria, which cover the effectiveness of play-based teaching strategies by reflecting the academic performance of third-grade students in mathematics: 1.75 – 1.75 (Never); 1.76 – 2.50 (Sometimes); 2.51 – 3.25 (Often); and 3.26 – 4.00 (Always). On the other hand, the following equivalencies correspond to the p-value based on the significant difference in students' performance before and after the play-based strategy was implemented: p-value <.01</mark> (Highly Significant); p-value <.05 (Significant); and p-value >.05 (Not Significant).

***Procedures***

The school principal was granted a letter of authorization to formally carry out the study's implementation as a first step. Before starting the experimental investigation on the chosen respondents, the researchers also asked the assigned teacher in the grade 3 division for permission. Additionally, before the respondents were included in the study, the researchers obtained their parents' agreement.

Following letter clearance and signatures, the researchers started their experimental investigation by integrating a play-based teaching technique with third-grade math students. Using the criterion checklist, the elements and effects of the play-based strategy and its influence on the academic performance of third-grade students were directly seen during the observation process. Two elementary math teachers in Magalang, Pampanga, as well as the department chair of the Pampanga State Agricultural University's (PSAU) Bachelor of Elementary Education program verified the checklist.

The collected information was utilized to compile and statistically assess students' performance and learning habits both before and after the play-based approach to mathematics was put into practice. To guarantee reliable and precise data results and findings, the researchers, under the supervision of the statistician, transparently computed and examined the results.

## III. Results and Findings

**Table 1.1.** Performance of the students before the implementation of play-based learning in mathematics as perceived by the teacher

| Criteria | Mean | Descriptive Rating |
|---|---|---|
| Learning Behavior | 2.64 | Often |
| Academic Performance | 2.54 | Often |
| Communication Skills | 2.58 | Often |
| Collaborative Skills | 2.13 | Sometimes |
| Engagement and Participation | 2.57 | Often |
| Mastery of Learning | 2.40 | Sometimes |
| **Grand Mean** | 2.48 | Sometimes |

Legend:
Scores Descriptive Rating
1.00-1.75 - Never
1.76-2.50 - Sometimes
2.51-3.25 - Often
3.26-4.00 - Always

Table 1.1 shows the students' performance before implementing play-based learning in mathematics as perceived by the teacher. Out of 20 respondents, the highest criteria was their *Learning behavior*, which got a mean of 2.64 with a descriptive rating of —Often, while the lowest was *Collaborative skills* with a mean of 2.13 and a descriptive rating of —Sometimes.

Based on the result of the mean, the majority excelled in their *Learning behavior* before the play-based approach was implemented. This implies that most of the respondents performed best at the criteria of learning behavior.

In a comparable manner, Noor et al. (2022) came to the conclusion in their study that students' learning behaviors contribute in the development and continual growth of healthy relationships, understanding and control of emotions, and the making of responsible choices.

**Table 1.2.** Performance of the students before the implementation of play-based learning in mathematics as perceived by the interrater

| Criteria | Mean | Descriptive Rating |
|---|---|---|
| Learning Behavior | 2.68 | Often |
| Academic Performance | 2.55 | Often |
| Communication Skills | 2.75 | Often |
| Collaborative Skills | 2.43 | Sometimes |
| Engagement and Participation | 2.67 | Often |
| Mastery of Learning | 2.48 | Sometimes |
| **Grand Mean** | 2.59 | Sometimes |

Legend:
Scores Descriptive
Rating 1.00-1.75
- Never
1.76-2.50 - Sometimes
2.51-3.25 - Often
3.26-4.00 - Always

Table 1.2 shows the students' performance before implementing play-based learning in mathematics as perceived by the interrater. Out of 20 respondents, the highest criteria was their *Communication skills*, which got a mean of 2.75 with a descriptive rating of —Often, while the lowest was *Collaborative skills* with a mean of 2.43 and a descriptive rating of —Sometimes.

Based on the result of the mean, the majority excelled in their *Communication skills* before play-based approach was implemented. This implies that most respondents performed best at the criteria of communication skills.

It is in line to a study by Shrivastava (2023) which revealed that effective communication contributes to the development of positive relationships with teachers, peers, and other school community members. Students who are effective communicators are more likely to build relationships, ask for help when they need it, and feel like they belong.

**Table 2.1.** Performance of the students after the implementation of play-based learning in mathematics as perceived by the teacher

| Criteria | Mean | Descriptive Rating |
|---|---|---|
| Learning Behavior | 3.59 | Always |
| Academic Performance | 3.54 | Always |
| Communication Skills | 3.88 | Always |
| Collaborative Skills | 3.75 | Always |
| Engagement and Participation | 3.78 | Always |
| Mastery of Learning | 3.60 | Always |
| **Grand Mean** | 3.69 | Always |

Legend:
Scores Descriptive
Rating 1.00-1.75
- Never
1.76-2.50 - Sometimes
2.51-3.25 - Often
3.26-4.00 - Always

Table 2.1 shows the students' performance after implementing play-based learning in mathematics as perceived by the teacher. Out of 20 respondents, the highest criteria was their *Communication skills*, which got a mean of 3.88 with a descriptive rating of —Always, while the lowest was *Academic Performance* with a mean of 3.54 and a descriptive rating of —Always.

Based on the result of the mean, the majority excelled in their *Communication skills* after the play-based approach was implemented. This implies that most respondents performed best at the criteria of communication skills.

Similarly, based on the study of Shrivastava (2023), students who have strong communication skills can contribute ideas, coordinate efforts, and resolve conflicts effectively, encouraging a positive and productive learning environment.

**Table 2.2.** Performance of the students after the implementation of play-based learning in mathematics as perceived by the interrater

| Criteria | Mean | Descriptive Rating |
|---|---|---|
| Learning Behavior | 3.27 | Always |
| Academic Performance | 3.06 | Often |
| Communication Skills | 3.60 | Always |
| Collaborative Skills | 3.18 | Often |
| Engagement and Participation | 3.33 | Always |
| Mastery of Learning | 3.28 | Always |
| **Grand Mean** | 3.29 | Always |

Legend:
Scores Descriptive
Rating 1.00-1.75
- Never
1.76-2.50 - Sometimes
2.51-3.25 - Often
3.26-4.00 - Always

Table 2.2 shows the students' performance after implementing play-based learning in mathematics as perceived by the interrater. Out of 20 respondents, the highest criteria was their *Communication skills*, which got a mean of 3.60 with a descriptive rating of —Always, while the lowest was *Academic Performance* with a mean of 3.06 and a descriptive rating of —Often.

Based on the result of the mean, the majority excelled in their *Communication skills* after the play-based approach was implemented. This implies that most respondents performed best at the criteria of communication skills.

The findings were aligned in accordance to the study conducted by Lancehgs (2024), effective communication is essential for both emotional and social development. Pupils with strong communication skills are more likely to have high self-esteem and to build strong bonds with both teachers and peers.

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**Table 3.1.** Significant difference between the performance of the students before and after the implementation of the play-based strategy in mathematics by the teacher

| Variables | | p-value | Verbal Interpretation |
|---|---|---|---|
| Learning Behavior Before Implementation | Learning Behavior After Implementation | .000 | Highly Significant |
| Academic Performance Before Implementation | Academic Performance After Implementation | .000 | Highly Significant |
| Communication Skills Before Implementation vs | Communication Skills After Implementation | .000 | Highly Significant |
| Collaborative Skills Before Implementation | Collaborative Skills After Implementation | .000 | Highly Significant |
| Engagement and Participation Before Implementation | Engagement and Participation After Implementation | .000 | Highly Significant |
| Mastery of Learning Before Implementation | Mastery of Learning After Implementation | .000 | Highly Significant |

Legend
Scores Verbal Interpretation

p-value <.01 - Highly Significant
p-value <.05 - Significant
p-value >.05 - Not Significant

Table 3.1 reveals the significant difference between the student's performance before and after the implementation of play-based approach in mathematics as rated by the teacher. The p-value of *Learning Behavior, Academic Performance, Communication Skills, Collaborative Skills, Engagement and Participation, and Mastery of Learning* before and after implementing play-based approach was .000, which is less than 0.1 with a verbal interpretation of —Highly Significant.

Based on the results, students' academic performance excelled before and after the play-based approach was implemented. Therefore, there is a significant difference in *Learning Behavior, Academic Performance, Communication Skills, Collaborative Skills, Engagement and Participation,* and *Mastery of Learning* of the students before and after the implementation of the play-based approach in mathematics. This implies that the respondents improved after the implementation of the play-based approach in mathematics.

The results were related to the study conducted by Taylor & Boyer (2019), whereby children's intellectual, social, and emotional development is the main focus of play-based learning, which is child-centered and aims to stimulate children's interests and skills through interesting and developmentally appropriate learning activities.

**Table 3.2.** Significant difference between the performance of the students before and after the

implementation of the play-based strategy in mathematics by the interrater

| Variables | | p-value | Verbal Interpretation |
|---|---|---|---|
| Learning Behavior Before Implementation | Learning Behavior After Implementation | .000 | Highly Significant |
| Academic Performance Before Implementation | Academic Performance After Implementation | .000 | Highly Significant |

| | | | |
|---|---|---|---|
| Communication Skills Before Implementation vs | Communication Skills After Implementation | .000 | Highly Significant |
| Collaborative Skills Before Implementation | Collaborative Skills After Implementation | .004 | Highly Significant |
| Engagement and Participation Before Implementation | Engagement and Participation After Implementation | .001 | Highly Significant |
| Mastery of Learning Before Implementation | Mastery of Learning After Implementation | .000 | Highly Significant |

Legend
Scores Verbal Interpretation
p-value <.01 - Highly Significant
p-value <.05 - Significant
p-value >.05 - Not Significant

Table 3.2 reveals the significant difference between the student's performance before and after the implementation of the play-based approach in mathematics. The p-value of *Learning Behavior, Academic Performance, Communication Skills* and *Mastery of Learning* was .000, *Collaborative skills* was .004 and *Engagement and Participation* was .001, which are all less than 01 with a verbal interpretation of —Highly Significant before and after the implementation of play-based approach.

Based on the results, students' academic performance excelled before and after the play-based approach was implemented. Therefore, there is a significant difference in *Learning Behavior, Academic Performance, Communication Skills, Collaborative Skills, Engagement and Participation*, and *Mastery of Learning* of the students before and after the implementation of the play-based approach in mathematics. These results reflect that the play-based strategy is highly effective in enhancing both the academic and interpersonal skills of students, leading to a more engaging and productive learning environment.

Similarly, as Sakib (2019) concluded in his study that children participate in active and engaging learning experiences that correspond to their unique interests and needs through play-based approach, this strategy enhances students' academic performance and learning behaviors which contribute to their physical, social, emotional, language and cognitive development.

## IV. Statements and Declarations

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## VI. Conclusion

Based on the results of the study, the following conclusions were drawn: a) Before the implementation of play-based strategy: students performed best with their learning behaviors as perceived by the teacher; students performed best with their communication skills as perceived by the interrater; b) After the implementation of play- based strategy: students performed best with their communication skills as perceived by the teacher; students performed best with their communication skills as perceived by the interrater; and c) The play-based strategy improved the performance of the students, thus, the null hypothesis is rejected.

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