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Project COSPLAY (Coaching, Singing, and Playing): An Intervention to Improve Multiplication Fact Recall of Struggling Grade Six Learners

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Abstract

This study aimed to enhance the multiplication fact recall of Grade 6 learners experiencing difficulties in memorizing basic multiplication facts. The intervention, titled Project COSPLAY—an acronym for Coaching, Singing, and Playing—was implemented over a fifteen-day period and comprised three distinct phases: (1) Coaching, involving a review of key multiplication concepts, including the Zero, Identity, and Commutative Properties; (2) Singing, where learners chanted multiplication facts to the tune of familiar nursery rhymes to facilitate memorization; and (3) Playing, utilizing the Android application Multiplication Memorizer to reinforce fluency through interactive games.

A one-group pretest-posttest design was employed to assess the effectiveness of the intervention. Quantitative data were analyzed using mean, standard deviation, and a paired samples t-test. Results indicated a significant improvement in learners' multiplication fact recall, with mastery levels increasing from 18.83% in the pretest to 90.70% in the posttest, reflecting an overall gain of 71.87%.

These findings suggest that Project COSPLAY is an effective strategy for improving multiplication fact recall among struggling learners. The incorporation of multisensory and game-based approaches is recommended for educators aiming to enhance foundational numeracy skills.

Keywords: *Multiplication fact recall, intervention, coaching, singing, educational games, Grade 6 learners*

INTRODUCTION

Mastery of basic multiplication facts is essential to students' success in mathematics, serving as a foundation for more advanced concepts such as multi-digit multiplication, division, fractions, ratios, and decimals (Bashir, 2019). These facts, defined as the products of multiplying single-digit numbers, also play a crucial role in enabling learners to solve mathematical problems efficiently and apply mathematical

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thinking in real-life contexts. Despite their importance, memorizing multiplication tables remains a persistent challenge for many elementary school students. The sheer volume of facts, combined with similarities between them, often leads to confusion and memory interference (Dotan et al., 2022). By Grade Six, students are expected to have developed fluency and automaticity in recalling these facts. However, observations show that many learners continue to rely on repeated addition or visual aids such as drawing sticks, revealing significant gaps in foundational numeracy.

To assess and improve basic academic competencies, the Department of Education (DepEd) has implemented standardized assessments such as the *Test on Fundamental Academic Skills* (TOFAS) across public schools in the National Capital Region (NCR). In San Joaquin Elementary School during School Year 2022–2023, TOFAS results reflected poor performance in fundamental mathematics skills, particularly multiplication and division. Out of 545 Grade Six test-takers, only 109 students (20%) passed. Similarly, among current sixth graders who were in Grade Five during the testing, only 201 out of 601 (33.44%) achieved passing scores. These findings were further supported by results from a five-minute diagnostic test using the Multiplication Window Card M1, which revealed that a majority of students had not memorized basic multiplication facts.

In response to the country's ongoing decline in mathematics performance, DepEd issued **Memorandum No. 110, s. 2022**, calling for the development of a National Mathematics Program. This directive recognizes that mathematical proficiency extends beyond procedural knowledge—it also requires the ability to relate math concepts to real-world applications. Furthermore, results from international large-scale assessments consistently show that Filipino learners underperform in mathematics compared to global benchmarks. Consequently, DepEd emphasizes the need for learner-centered interventions tailored to students with learning difficulties. This is reinforced by **DepEd Order No. 21, s. 2019**, which supports flexible learning options and alternative delivery modes responsive to learners' diverse needs and contexts.

Guided by these findings and educational policies, this study introduces an intervention titled **Project COSPLAY**—*Coaching, Singing, and Playing*—to improve the multiplication fact recall of struggling Grade Six learners. The intervention consists of three components:

1. **Coaching** – A structured review of core multiplication concepts and properties (e.g., Zero, Identity, Commutative) to establish a strong conceptual understanding.

2. **Singing** – Based on findings in music psychology (Holmes, 2017; Wentworth, 2019), musical strategies were used to support memory retention. Learners sang adapted nursery rhymes featuring multiplication facts, transforming rote memorization into a more engaging experience.

3. **Playing** – Educational games and digital game-based learning (DGBL) provide pupils interactive, engaging, intelligent, and motivating learning environments (Leonardo A. et.al, 2021).Digital game-based learning (DGBL) was employed to reinforce fluency. Learners used the *Multiplication Memorizer* Android application, developed by Math Domain Development, to complete interactive drills aimed at improving both speed and accuracy in recalling multiplication tables.

The intervention was informed by the results of the August 29, 2023, diagnostic assessment using the M1 Window Card. Among 170 pupils from four heterogeneous Grade Six sections, only 20 students (11%) scored 50 or higher, indicating an urgent need for a focused and effective response. Thus, the primary objective of this study is to improve the multiplication fact recall of these learners through an integrated, engaging, and research-based intervention.

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ACTION RESEARCH QUESTIONS

This study aimed to improve the multiplication fact recall of the struggling Grade Six learners through Project COSPLAY.

Specifically, it seeks to answer the following questions:

1. What are the pretest and posttest performance levels of Grade Six learners in recalling multiplication facts before and after the implementation of Project COSPLAY?
2. To what extent does Project COSPLAY improve the fluency of Grade Six learners in recalling multiplication facts?

METHODOLOGY

A. Research Design

This study employed a **one-group pretest-posttest design**, a type of quantitative research under action research. This design was selected to measure the effect of the intervention—*Project COSPLAY*—on the multiplication fact recall of struggling Grade Six learners. The design enabled the comparison of learner performance before and after the implementation of the intervention.

B. Participants

The study involved 60 Grade Six learners from San Joaquin Elementary School, specifically selected from Sections 6, 9, 11, and 14. Purposive sampling was used to choose the respondents. Participants were identified using the Five-Minute Multiplication Fact Test, a diagnostic assessment administered prior to the intervention. Learners who obtained the lowest scores on the test were classified as struggling in multiplication fact recall and were subsequently included in the study. The selection process ensured that the participants represented a diverse mix of learners requiring targeted support in foundational numeracy skills.

C. Intervention: Project COSPLAY

The intervention program, titled Project COSPLAY (Coaching, Singing, and Playing), was implemented over a period of 15 consecutive school days, with each session lasting approximately 25 minutes. The intervention was structured into three progressive phases, each designed to enhance multiplication fact recall through multisensory and interactive approaches.

Phase 1: Coaching (Days 1–2)

During the initial phase, the teacher provided direct instruction and review of key multiplication concepts. Emphasis was placed on the Zero, Identity, and Commutative Properties of multiplication to establish a strong conceptual foundation. Guided discussions and sample problem-solving tasks were used to clarify misconceptions and reinforce understanding.

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Phase 2: Singing (Days 3–12)

In this phase, learners practiced multiplication facts through rhythm-based memorization using adapted nursery rhymes. Each set of multiplication facts9was set to the tune of a familiar song,

Table 1. Applied Tunes for Multiplication Facts

Multiples (N x 2 to N x10)	**Original Song**	**Multiples with Applied Tunes**
Multiples of 2	My Toes, My Knees	My Two's, My Knees
Multiples of 3	Jingle Bells	Three Jingle Bells
Multiples of 4	Row Row Row Your Boats	Row Row Row Your Four Boats
Multiples of 5	Skip Counting by 5	Skip Counting by 5
Multiples of 6	ABC Song	AB6
Multiples of 7	Happy Birthday to You	Happy Birthday Seven
Multiples of 8	If You're Happy and You Know it	It You're Happy and You Know Eight
Multiples of 9	Are You Sleeping Brother John	Are You Sleeping Brother Nine
Multiples of 10	Skip Counting By 10	Skip Counting By 10

allowing students to engage in active recall through musical repetition. As learners became more familiar with the tunes, the teacher gradually removed some of the multiples during singing to encourage independent recall and memorization.This music-based strategy leveraged the power of rhythm and melody to enhance retention and recall, making learning both

enjoyable and effective.

Phase 3: Playing (Days 13–15)

The final phase involved digital game-based learning. Learners used the Multiplication Memorizer Android application in a structured classroom setting. The app provided interactive drills, timed exercises, and game-based challenges designed to build speed and fluency in recalling

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multiplication facts. Pupils engaged individually with the app, allowing for differentiated pacing and instant feedback on their performance.

D. Research Instruments

1. **Five-Minute Multiplication Fact Test (Multiplication Window Card M1)**
   A researcher-developed tool consisting of 100 randomly arranged multiplication facts from 1 to 10. It was used as both a pretest and posttest to assess learners' proficiency in recalling multiplication facts.

2. **Observation Checklist**
   A checklist used to track learners' engagement, participation, and behavior during the intervention, providing qualitative data to complement the quantitative results.

3. **Teacher's Journal**
   A reflective journal kept by the teacher-researcher to record daily observations, challenges, and learner progress during the intervention. This tool provided additional insights into the intervention's effectiveness.

E. Data Analysis

To assess the effectiveness of *Project COSPLAY* in enhancing learners' multiplication fact recall, a pre-post analysis was conducted. This directly addressed the research question: *"To what degree will Project COSPLAY increase pupils' fluency in recalling multiplication facts?"*

A paired samples t-test (also known as a dependent samples t-test) was utilized to compare learners' pretest and posttest scores on the Five-Minute Multiplication Fact Test. This statistical method is appropriate for determining whether the mean difference between two related sets of scores—obtained from the same participants before and after the intervention—is statistically significant.

In addition to inferential statistics, descriptive statistics were employed to further evaluate performance changes. Measures such as mean, standard deviation, and mean gain score (difference) were calculated to provide a clear picture of the learners' improvement in multiplication fact recall as a result of the intervention.

This combination of descriptive and inferential analyses ensured a comprehensive examination of the intervention's impact, offering both statistical validity and practical insights into its effectiveness.

F. Data Collection Procedure

1. Ethical Considerations and Approvals
   Prior to the study's implementation, approval was obtained from the school principal and the Schools Division Superintendent. Additionally, informed consent was secured from the parents or guardians of all participating learners, ensuring adherence to ethical standards and respect for participants' rights.

2. Pretest Administration
   The Five-Minute Multiplication Fact Test was administered to all identified participants to

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establish a baseline of their multiplication fact recall proficiency. The test was conducted in a timed, standardized setting to ensure consistency.

3. Implementation of the Intervention
   The intervention program, *Project COSPLAY*, was conducted over 15 school days, with daily 25-minute sessions. The three phases—Coaching, Singing, and Playing—were delivered in sequence. Learners' attendance, engagement, and behavior were closely monitored using the observation checklist, and insights were regularly recorded in the teacher's journal.

4. Posttest Administration
   At the conclusion of the intervention, the same Five-Minute Multiplication Fact Test was re-administered to evaluate learners' performance gains and improvements in multiplication fact recall.

RESULTS AND ANALYSIS

This section presents, analyzes, and interprets the data collected through the intervention. The data were processed using various statistical tests and are displayed, analyzed, and discussed in this chapter.

Specifically, the presentation focuses on:

1. The performance level of struggling Grade Six learners in multiplication fact recall before and after the implementation of Project COSPLAY, as well as the extent of improvement resulting from the intervention. Learners' performance is described using the following descriptive proficiency levels commonly used in reporting learners' quarterly assessment results:

   - **90 – 100**: Highly Proficient
   - **75 – 89**: Proficient
   - **50 – 74**: Nearly Proficient
   - **25 – 49**: Low Proficient
   - **0 – 24**: Not Proficient

Table 2.

Paired Test Results of the Participants

	Pretest	Proficiency Level	Posttest	Proficiency Level	Difference
Mean	18.83		90.70		71.87
Percentage	18.83	Not Proficient	90.70	Highly Proficient	71.87
Standard Deviation	8.23		9.37		8.92

Using a paired sample t-test, the pretest multiplication scores were compared to the posttest scores to determine whether there was a significant difference in the learners' performance due to the intervention.

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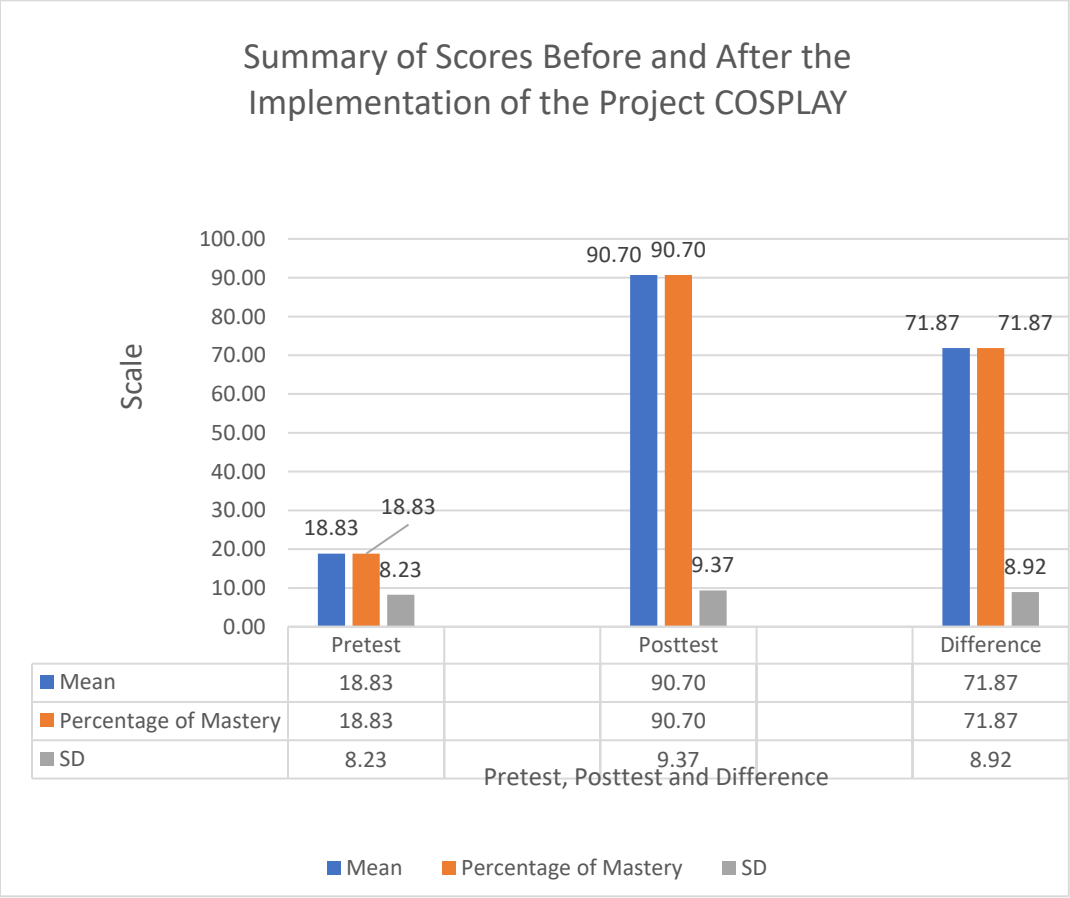

Figure 1..This figure shows increase in the performance of the learners as a result of the intervention.

Figure 1 shows the pretest, posttest, and difference of percentage of mastery, mean, and standard deviation acquired by selected grade six learners. The pretest reveals a very low performance of the pupils in multiplication fact recall. They only got a mastery of 18.83% that was identified as not proficient , mean of 18.83 and a standard deviation of 8.23. On the other hand, a big leap in their performance has been materialized on the posttest having a percentage of mastery of 90.70%, identified as highly proficient, mean of 90.70 and standard deviation 9.37. There is a difference of 71.87% in the percentage of mastery, 71.87 in mean and 8.92 in the standard deviation.

DISCUSSION

The results presented in the figure titled *"Summary of Scores Before and After the Implementation of the Project COSPLAY"* demonstrate a marked improvement in learners' performance following the intervention. The pretest data reveal that learners had a very low level of proficiency in multiplication fact recall, with both the mean score and percentage of mastery at 18.83, categorized as *not proficient*. The standard deviation of 8.23 indicates moderate variability in learners' scores at the outset.

Following the implementation of Project COSPLAY, the posttest results show a significant increase in performance. The mean score and percentage of mastery both rose to 90.70, reclassifying the learners'

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proficiency level as *highly proficient*. The standard deviation also increased slightly to 9.37, suggesting a small rise in score dispersion, though the overall performance remained consistently high.

The difference scores—a 71.87-point increase in both mean and mastery, and an 8.92 increase in standard deviation—underscore the strong effectiveness of the intervention. These gains suggest that Project COSPLAY successfully addressed learning gaps in foundational mathematics, specifically in multiplication fact recall, which is essential for mathematical fluency and future problem-solving success. This outcome aligns with educational research, such as the work of Barrot (2021) and Carambas & Espique (2023), which emphasizes the value of structured, engaging, and contextually relevant interventions in recovering foundational learning losses, particularly in post-pandemic contexts. The slight increase in standard deviation may also indicate a need for continued differentiation, as supported by Hoglund (2022), who advocates for adaptable strategies that accommodate diverse learner needs.

Moreover, the flexibility of the intervention makes it applicable across various age groups. Since the melodies used were derived from universally known nursery rhymes, Project COSPLAY can be easily adapted for younger learners. If introduced at the primary level, this strategy could help establish fluency in multiplication early on, potentially preventing the difficulties commonly observed by the time learners reach Grade Six. By making multiplication practice enjoyable and memorable, this intervention not only bridges existing learning gaps but also provides a proactive approach to foundational skill development in mathematics.

In summary, the findings validate the effectiveness of Project COSPLAY in enhancing multiplication fact recall. The intervention's combination of music and gamified learning created a motivating environment that supported memory retention and fluency. It offers a promising approach that can be implemented across different grade levels to improve foundational mathematical skills.

CONCLUSION

The ability to recall basic multiplication facts is a fundamental skill in a learner's mathematical development and serves as a building block for mastering more complex concepts. However, data from standardized assessments such as TOFAS and diagnostic tools like the M1 Window Card indicate that many Grade Six learners continue to struggle with multiplication despite several years of exposure. This persistent learning gap underscores the urgent need for innovative, engaging, and learner-centered instructional approaches.

In response to this need, **Project COSPLAY (Coaching, Singing, and Playing)** was designed and implemented at San Joaquin Elementary School to support learners experiencing difficulty with multiplication recall. By integrating direct instruction with music—particularly familiar nursery rhymes—and interactive digital tools, the intervention created an engaging and developmentally appropriate learning experience. Beyond improving multiplication fact recall, Project COSPLAY fostered a positive and motivating learning environment that encouraged learner autonomy and enjoyment in practicing math.

The findings of the study affirm the effectiveness of Project COSPLAY as a targeted intervention for improving numeracy skills, particularly among learners who do not thrive in traditional classroom settings. It aligns with the Department of Education's advocacy for flexible, inclusive, and contextually relevant teaching strategies aimed at strengthening foundational competencies. Its simplicity, accessibility, and adaptability make it a viable instructional tool not only for Grade Six but also for younger learners at earlier stages of mathematical development.

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In conclusion, Project COSPLAY demonstrates that significant improvements in multiplication recall can be achieved through creative and engaging pedagogical strategies. With broader implementation, this intervention has the potential to contribute meaningfully to improved learner outcomes in mathematics, both in everyday classroom instruction and in national assessment performance.

RECOMMENDATIONS

Based on the study's findings, the following recommendations are proposed:

1. Expand Project COSPLAY Implementation

   Adopt Project COSPLAY in other grade levels and in other schools, especially in early elementary, to build multiplication fluency and prevent learning gaps. The researcher may propose the intervention to the whole division of Pasig City as an innovation in Mathematics.

2. Use of Music and Gamified Tools

   Encourage the integration of music and interactive apps like Multiplication Memorizer to boost engagement, retention, and fluency in math.

3. Teacher Training

   Provide professional development to train teachers in implementing Project COSPLAY and similar innovative strategies.

4. Curriculum Integration

   Incorporate creative, multisensory approaches into the math curriculum to better meet learners' developmental needs.

5. Further Research

   Conduct studies on the long-term impact of Project COSPLAY and explore its application to other math areas and learner groups.

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