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PROJECT TIMES: ENHANCING NUMERACY THROUGH ICT INTEGRATION IN MULTIPLICATION MASTERY AMONG GRADE VI-HUMILITY LEARNERS

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ABSTRACT

This action research aimed to address the low numeracy levels of Grade VI-Humility learners at Rosario East Central School, particularly in mastering multiplication facts. The research was conducted in two phases: pre-assessment (August 2023) and post-assessment (November 2023). Based on a teacher-made numeracy test in multiplication, 17 out of 35 students were categorized as "Moderately Non-Numerate," and only 2 were considered "Highly Numerate." The intervention employed was Project TIMES (Teaching Intensively Multiplication tables for Every Student), integrating Information and Communication Technology (ICT) through the use of offline digital flashcards. After one semester of daily multiplication drills during lunch breaks and free time, post-intervention results showed a significant improvement: 16 students were now "Highly Numerate," and only 3 students remained in the "Moderately Non-Numerate" category. This research demonstrates the effectiveness of ICT integration in improving multiplication fluency and overall numeracy levels among students.

Keywords: *Project TIMES, numeracy, ICT Integration, multiplication mastery*

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CONTEXT AND RATIONALE

In the early years of education, children build upon their foundational knowledge of simple addition and subtraction by advancing into basic multiplication and division. The ability to solve simple multiplication problems and apply multiplicative thinking is crucial for everyday life. While technology can readily provide answers, understanding "what the numbers mean and how they fit into the real world" (Palmer, 2012) is highly beneficial. For example, learning multiplicative thinking early on equips future business owners with the skills to calculate pay rates, profits, expenses, and units without relying on technology. Multiplicative thinking also proves useful when cooking, grocery shopping, and calculating clothing discounts. Instilling in children the ability to solve such problems without technology encourages them to apply these skills in real-world scenarios.

Despite the importance of mathematical skills, the Southeast Asia Primary Learning Metrics 2019 (SEA-PLM) revealed that only 1% of Filipino students met the minimum mathematical standard expected at the end of primary education, as outlined in SDG 4.1.1 Education Proficiency. The average score of Grade 5 students in the Philippines was 288, indicating that while most students could apply basic number properties and unit measurements, only 17% were capable of performing more complex mathematical operations like working with fractions and interpreting tables and graphs (Dela Peña, 2022).

Following nearly two years of pandemic-related disruptions, public elementary and high schools in the Philippines returned to traditional five-day face-to-face classes on November 2, 2022. This shift was mandated by Vice President and Education Secretary Sara

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Duterte through DepEd Order No. 34, s. 2022, which outlined the school calendar for the 2022-2023 academic year and was made public on July 2.

To ensure the quality of education, teachers are required to conduct regular formative assessments, while the Bureau of Education Assessment (BEA) oversees national assessments such as the Early Language Literacy and Numeracy Assessment (ELLNA) and the National Achievement Test (NAT). The ELLNA evaluates literacy and numeracy in 19 languages for Grade 4 students, while the NAT, an exit exam administered to Grades 6, 10, and 12, assesses 21st-century skills like problem-solving and critical thinking. These assessments align with the Most Essential Learning Competencies (MELCs) and serve as benchmarks for identifying learning gaps and preparing interventions as per DepEd Order 27, s. 2022.

DepEd also encourages the implementation of contextualized learning recovery strategies, focusing on three key areas: (a) learning remediation and intervention, (b) socio-emotional functioning, mental health, and well-being, and (c) professional development of teachers (DepEd Order No. 34, s. 2022). In response, schools in the Division of Batangas have developed Learning Recovery and Continuity Plans (LRCPs) to address learning gaps, improve outcomes, and enhance learners' overall well-being.

Among the challenges in education, mathematics, particularly memorizing multiplication tables, often causes anxiety for students, making it one of the most difficult subjects to teach and learn. This issue becomes more pronounced when foundational skills, such as multiplication, are essential for higher-level mathematical operations like division, fractions, and algebra. In the case of Grade VI-Humility students at Rosario East Central

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School, a teacher-made numeracy test conducted in August 2023 highlighted significant difficulties with multiplication, pointing to a critical gap in mathematical understanding and an urgent need for intervention.

Multiplication mastery is not only key to classroom success but also has real-world applications, such as managing a budget, calculating grocery costs, or understanding time and distance during travel. The inability to quickly recall multiplication facts can undermine students' confidence in both academic and practical tasks. Furthermore, multiplication is foundational for more advanced topics such as fractions, percentages, ratios, and algebra. Without fluency in multiplication, students are likely to struggle with these concepts, leading to frustration and anxiety.

In response to this challenge, the researcher developed and implemented Project TIMES (Teaching Intensively Multiplication tables for Every Student), an intervention aimed at improving multiplication fluency through the use of Information and Communication Technology (ICT) tools. Offline digital flashcards were selected for their versatility and interactivity, allowing students to practice multiplication in a timed, game-like format. This timed approach was crucial in helping students develop automaticity—the ability to recall multiplication facts quickly and without hesitation.

Project TIMES centered around regular, structured practice sessions held during lunch breaks and free time, providing students with daily opportunities to engage with multiplication problems in a low-pressure, competitive environment. Based on cognitive science principles, frequent exposure to material combined with spaced repetition improves retention and recall.

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Through the consistent use of ICT tools, students could practice multiplication in a way that was both engaging and effective. The immediate feedback offered by the digital format also allowed students to correct mistakes in real-time, further enhancing their learning.

The ICT-based design of Project TIMES increased student motivation by making the learning process interactive and enjoyable. The combination of structured practice and technology improved students' multiplication fluency and built their confidence in math. By the end of the intervention, the students showed significant improvements in their numeracy levels, as evidenced by the post-test results. The success of Project TIMES demonstrates the potential of using ICT tools to address foundational mathematical gaps, offering a promising model for future interventions.

ACTION RESEARCH QUESTIONS

This action research sought to answer the following questions:

1. What are the results of the pre-assessment of the Grade VI-Humility learners in multiplication before the implementation of Project TIMES?
2. How effective is the use of ICT-based tools, specifically digital flashcards, in improving multiplication fluency?
3. To what extent did the numeracy levels of students improve after the implementation of Project TIMES?
4. What information-dissemination material can be proposed to strengthen the multiplication mastery of Grade VI-Humility learners through Project TIMES?

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PROPOSED INNOVATION, INTERVENTION, AND STRATEGY

Project TIMES was crafted as an innovative, ICT-based intervention designed to tackle the low mastery of multiplication facts among Grade VI-Humility learners. Multiplication fluency is crucial for higher-level math and everyday problem-solving, yet many students struggle with the rote memorization traditionally associated with learning times tables. The intervention used offline digital flashcards, which presented multiplication problems with a timed component, urging students to answer quickly and accurately. The timed aspect was key, as it fostered a sense of urgency and helped students build automaticity—the ability to recall facts almost instinctively. These sessions were incorporated into non-instructional times such as lunch breaks and free periods, ensuring that students received consistent practice without cutting into class time or other subjects.

The choice to use ICT tools, particularly digital flashcards, was rooted in the understanding that technology can make learning more engaging and dynamic. Research supports the idea that digital tools can cater to different learning styles: visual learners benefit from the flashcard interface, auditory learners can engage through repetition, and kinesthetic learners interact with the technology. This approach provided students with a more stimulating alternative to traditional pen-and-paper drills, reducing the monotony that can come with repetitive tasks like memorizing multiplication tables. The flashcards also introduced a gamified element to the learning process, turning what might otherwise be a tedious exercise into a fun, competitive challenge. This heightened student engagement and motivation, leading to more enthusiastic participation.

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Additionally, ICT tools offered the significant advantage of providing immediate feedback, which is critical in the learning process. With traditional methods, students often have to wait until the teacher reviews their work to understand where they went wrong. In contrast, the digital flashcards provided instantaneous feedback, allowing students to correct their mistakes in real-time. This immediate reinforcement helped build confidence and encouraged students to keep practicing until they improved. The more frequently students practiced, the more familiar they became with multiplication facts, strengthening their ability to recall information quickly. Over time, this frequent, low-pressure exposure to multiplication facts fostered greater retention and fluency.

The regular use of timed digital flashcards created a learning environment that was not only engaging but also allowed for incremental improvement. By using the flashcards during free periods and lunch breaks, students were able to practice consistently without feeling overwhelmed or that they were sacrificing time meant for other subjects. The timed aspect of the exercises further helped to simulate real-life applications of multiplication, where quick and accurate recall is often necessary. The intervention ultimately aimed to develop a more holistic numeracy skill set among the learners, equipping them not only for academic success but also for practical, everyday situations where multiplication skills are required. This strategic, technology-integrated approach showed promise in transforming students' attitudes towards mathematics and enhancing their overall numeracy.

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Action Research Methodology

a. Sampling

The sample for this research consisted of 35 Grade VI-Humility learners enrolled at Rosario East Central School for the School Year 2023-2024. All students in the class were included in the study, providing a full representation of the numeracy levels within the group. The students were selected due to their participation in the initial numeracy test conducted in August 2023, which identified the need for targeted intervention in multiplication fluency.

b. Data Collection

Data were collected at two stages: pre-intervention and post-intervention. In August 2023, a teacher-made numeracy test consisting of 20 multiplication problems was administered to assess the baseline multiplication skills of the students. The same test was given in November 2023, after the implementation of Project TIMES, to measure improvements in numeracy levels. Additional data were collected through observations of student engagement during the intervention, and informal feedback was gathered from students and parents to assess the perceived effectiveness of the intervention.

c. Ethical Issues

This research adhered to ethical guidelines, ensuring that the rights and privacy of all participants were protected. Informed consent was obtained from both the students and their parents prior to the implementation of the project. Participation was voluntary, and students were informed that their performance data would be used solely for research purposes.

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Secrecy was maintained by using codes instead of names in the data analysis. Additionally, the use of ICT tools was carefully monitored to ensure that they were age-appropriate and did not cause undue stress or pressure on the learners.

d. Plan for Data Analysis

Data from the pre-test and post-test were analyzed using descriptive statistics, specifically focusing on the frequency distribution of student scores across different numeracy categories (Highly Numerate, Moderately Numerate, Numerate, Moderately Non-Numerate, and Non-Numerate). Improvements in individual student performance were tracked to determine the effectiveness of the intervention. Additionally, qualitative data from observations and informal feedback were thematically analyzed to assess changes in student attitudes toward multiplication and mathematics in general.

DISCUSSION OF RESULTS AND REFLECTION

This part presented the finding of the study which is presented through tabular forms with interpretation and analysis.

Table 1: Pre-Assessment Results

Score	Frequency	Description
15-20	2	Highly Numerate
10-14	3	Moderately Numerate
5-9	11	Numerate

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1-4	17	Moderately Non-Numerate
0	1	Non-Numerate

The pre-assessment results reveal a significant disparity in numeracy skills among the students. Only 2 students (5.26%) fall under the "Highly Numerate" category, showing strong proficiency, while 3 students (7.89%) are "Moderately Numerate," indicating moderate competency. The largest group, with 11 students (28.95%), is categorized as "Numerate," possessing basic numeracy skills but needing improvement. However, the majority of the class—17 students (44.74%)—are "Moderately Non-Numerate," struggling significantly with numeracy, and 1 student (2.63%) is "Non-Numerate," showing no numeracy skills at all. This distribution highlights a critical need for intervention, particularly for the 61.84% of students who fall into the "Moderately Non-Numerate" and "Non-Numerate" categories, as they lack essential mathematical foundations necessary for academic success.

Table 2: Post-Assessment Results

Score	Frequency	Description
15-20	16	Highly Numerate
10-14	10	Moderately Numerate
5-9	6	Numerate
1-4	3	Moderately Non-Numerate
0	0	Non-Numerate

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The results of the post-intervention assessment conducted in November 2023 showed a marked improvement in the numeracy levels of the Grade VI-Humility learners. Before the intervention, only 2 students were classified as "Highly Numerate," while 17 were "Moderately Non-Numerate" and 1 was "Non-Numerate." After one semester of Project TIMES, the number of "Highly Numerate" students rose to 16, while the number of "Moderately Non-Numerate" students decreased to just 3, and there were no students in the "Non-Numerate" category.

The study reveals that ICT-based tools, specifically digital flashcards, are highly effective in improving multiplication fluency among Grade VI-Humility learners. The use of these interactive, offline flashcards contributed significantly to students' improved numeracy levels, as evidenced by a marked increase in the number of "Highly Numerate" students and a drastic reduction in those classified as "Moderately Non-Numerate" or "Non-Numerate." In the pre-assessment, 61.84% of students were struggling, with most scoring in the lower numeracy categories. However, after one semester of targeted intervention through Project TIMES, 16 students achieved the "Highly Numerate" category, a substantial improvement from the initial 2 students in this range. This shift suggests that the regular practice provided by the digital flashcards—incorporating elements of interactivity, timed challenges, and gamification—helped students practice multiplication in an engaging manner, reducing anxiety and building confidence in their math skills.

The positive feedback from students indicated that the competitive and game-like experience of using flashcards motivated them to improve their recall speed and accuracy, enhancing both their learning experience and attitude toward mathematics. The timed

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component introduced a constructive challenge, promoting faster recall and strengthening mastery of multiplication facts. However, a noted challenge was ensuring equal access to the tools for all students, particularly those needing additional time or support.

To further strengthen multiplication mastery, it is proposed to develop a well-structured information-dissemination material under Project TIMES, possibly a user-friendly guide or infographic that highlights the benefits of digital flashcards, the progress achieved, and recommendations for consistent practice. This material could serve as a practical resource for both teachers and parents, encouraging them to incorporate similar ICT-based tools in daily study routines.

Action Research Workplan and Timeline

Activity	Duration	Scheme of Implementation	Resources Needed
Preliminary Testing Skills	1 hour (August 2023)	Conducting pre-test to assess multiplication	Pre-test answer sheets
Information Dissemination	1 hour	Inform parents about project and progress	Meeting materials, attendance sheets

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Daily Practice Sessions	1 semester (Aug-Nov)	Timed digital (power point) flashcard drills during lunch break and free time	Laptops, offline digital flashcards
Post-Assessment	1 hour (Nov 2023)	Conduct post-test to measure improvement	Post-test worksheets
Data Analysis and Reporting	1 week	Analyze results and prepare research report	Excel Sheets for data analysis

Cost Estimates

Item/Resource	Estimated Cost
Digital Flashcards	0
Printing of Answer sheets	100
Materials for Parent Meetings	500
Miscellaneous	300
Total	**800**

Plan for Dissemination and Utilization

The findings of this research will be shared with school administrators, fellow educators, and parents during a formal presentation. A summary of the results will be included in a school newsletter to inform the broader school community of the success of Project

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TIMES. Additionally, the intervention strategy, along with recommendations for scaling the project, will be presented during professional development workshops for teachers, with the aim of expanding the use of ICT tools to improve numeracy in other grade levels.

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Financial Report

Item/Resource	Estimated Cost
Digital Flashcards	0
Printing of Answer sheets	150
Materials for Parent Meetings	800
Miscellaneous	500
Total	**1450**