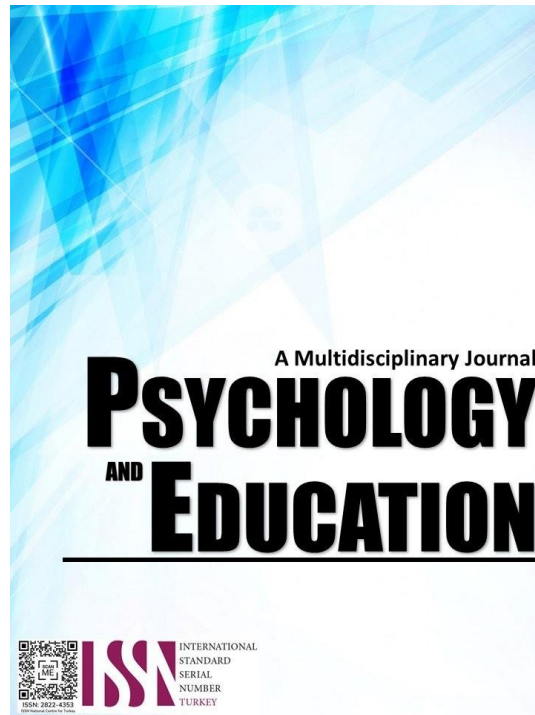


EFFECTIVENESS OF ENHANCED MODULES AS A TARGETED INTERVENTION TO IMPROVE GRADE 4 LEARNERS' MATHEMATICAL COMPETENCY



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Effectiveness of Enhanced Modules as a Targeted Intervention to Improve Grade 4 Learners' Mathematical Competency

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Abstract

Mathematics plays a vital role in developing critical thinking and problem-solving skills. However, many learners, especially in the early grades, struggle with foundational concepts due to the abstract nature of the subject and lack of targeted instructional strategies. This study investigated the effectiveness of enhanced mathematics modules as a structured intervention to improve the numeracy proficiency of Grade 4 learners. Employing a pre-test-post-test control Group Design, the study involved 40 pupils from a division school in Romblon, who were stratified based on prior mathematics performance and randomly assigned to control and experimental groups. The control group received regular instruction, while the experimental group received enhanced modules focusing on core fraction operations. Numerical results showed a significant improvement in the experimental group's post-test performance ($M = 21.38$, $SD = 4.91$) compared to the control group ($M = 13.98$, $SD = 4.83$), with a computed t -value of 3.998, exceeding the critical value of 1.843 at a 0.05 significance level. This indicates a meaningful impact of the enhanced modules on mathematical competency. The study supports integrating modular learning with differentiated instruction, formative assessment, and scaffolded content as an effective intervention in addressing early-grade numeracy gaps. The findings suggest a need to institutionalize modular interventions to promote equitable learning outcomes across diverse learner profiles.

Keywords: *enhanced mathematics modules, numeracy skills, Grade 4 learners, modular instruction, mathematics intervention*

Introduction

Mathematics plays a crucial role in developing critical thinking and problem-solving skills. However, many students struggle with mathematics due to its abstract concepts and complex procedures (Zhang et al., 2022). Negative attitudes toward the subject often stem from anxiety and a lack of effective instructional strategies (Carey et al., 2017).

Research shows that students' mathematical performance frequently lags behind literacy skills (OECD, 2019). Despite efforts to improve numeracy, interventions focus more on reading, with fewer structured programs addressing math difficulties (Powell et al., 2021). The COVID-19 pandemic further disrupted mathematics education, exacerbating learning gaps due to challenges transitioning to online modalities and limited access to instructional resources (Borup et al., 2020).

The 2018 Programme for International Student Assessment (PISA) reported that Filipino students scored an average of 353 in mathematical literacy, well below the OECD average of 489, indicating a low level of proficiency (OECD, 2019). Several educational initiatives have focused on creating contextualized, skills-based learning materials to enhance foundational math competencies in response to these persistent gaps.

One such intervention is the enhanced Mathematics module, which aims to support students in mastering the four basic operations through locally developed modules. These materials align with the goals of the Enhanced Basic Education Act of 2013 (RA 10533), which advocates for curriculum contextualization and community-developed instructional resources. This study aims to assess the effect of the enhanced mathematics modules on student performance in mathematics, particularly in addressing foundational numeracy skills.

Research Objectives

This study aims to evaluate the effectiveness of enhanced instructional modules as a targeted intervention for improving Grade 4 learners' mathematical competency. Specifically, it sought to determine whether there is a significant difference in numeracy levels between the control and experimental groups after the enhanced modules are implemented.

Methodology

The study employed an experimental research design, recognized for its structured and controlled nature, to investigate the effectiveness of the enhanced math module in improving numeracy skills among Grade 4 learners. Specifically, the Pre-test–Post-test Control Group Design was adopted to assess changes in learners' performance before and after the intervention. Forty Grade 4 pupils from a division school in Romblon were selected using a stratified-purposive sampling technique, which ensured a balanced representation of learners based on their previous academic performance in mathematics. Learners were ranked according to their final grades in the preceding school year and assigned numbers; even-numbered pupils were placed in the experimental group, while odd-numbered pupils were allocated to the control group. This systematic assignment was used to promote fairness and reduce sampling bias, ensuring both groups

were comparable in terms of numeracy skill levels at the outset.

Before the intervention, baseline data revealed that most participants from both groups fell within the "Non-numerate" and "Emergent Numerate" categories, with minimal representation in higher numeracy levels. The research instrument, the Division Numeracy Test—developed and validated by mathematics educators in Romblon—was used for both the pre-test and post-test. The pre-test was administered to all participants before the intervention period, during which the control group continued with the standard curriculum while the experimental group received supplementary instruction through the enhanced math modules. Lessons focused on fundamental topics such as the addition and subtraction of fractions and were conducted during scheduled weekly sessions. The post-test, identical to the pre-test, was given at the end of the intervention. Data collection adhered to ethical standards, including acquiring proper permissions from relevant school and division authorities. The structured sampling, intervention, and testing process ensured the reliability and validity of findings, enabling a meaningful evaluation of the enhanced math module’s impact on Grade 4 learners' numeracy proficiency.

Moreover, the study was conducted with careful attention to detail, following a comprehensive and well-structured data collection process. This included securing necessary permissions, administering pre- and post-tests, and implementing the intervention program. The rigorous methodology strengthened the reliability and validity of the findings, enabling the researcher to effectively address the study’s objectives and answer the core research questions.

Results and Discussion

Significant Difference between the Numeracy Level of the Control and Experimental Group after Utilizing the Enhanced Mathematics Module

The results presented in Table 1 demonstrate a statistically significant difference in the post-test numeracy scores between the control group (M = 13.98, SD = 4.83) and the experimental group (M = 21.38, SD = 4.91), with a computed t-value of 3.998 exceeding the critical value of 1.843 at a 0.05 significance level. Consequently, the null hypothesis was rejected, indicating that the use of the Enhanced Mathematics Module significantly improved the mathematical competency of Grade 4 learners.

Table 1. T-test Result of Numeracy Level of the Control and Experimental Group after the Experiment

Variables	Mean	SD	t-stat	Computed t-value	Critical Value	Decision	Results
Numeracy Level of the Control and Experimental Groups after the Experiment	13.98 (X1)	4.83 (SD1)	3.998	2.45	1.843	Reject Ho	Significant

The results of the study corroborate earlier findings emphasizing the effectiveness of structured, targeted instructional interventions in improving mathematics performance among elementary learners (Bayocot, 2021; Patahuddin et al., 2018). Enhanced mathematics modules, as used in this study, offer a learner-centered approach that facilitates independent learning by allowing students to progress at their own pace. This flexibility is particularly advantageous in addressing diverse learning needs within a classroom, as it permits individualized pacing and reinforces mastery through repetition and concept reinforcement. Flores (2010) noted that such modular instruction promotes deeper conceptual understanding by segmenting complex content into manageable units, providing consistent opportunities for deliberate practice and immediate feedback. These instructional features not only mitigate common learning difficulties but also foster learner autonomy, which is crucial for internalizing fundamental mathematical concepts.

The marked improvement in post-test scores observed among the experimental group participants suggests that enhanced modules serve as an effective medium for closing foundational gaps in numeracy. The incorporation of scaffolded exercises, formative assessments, and interactive tasks within the modules likely contributed to improved learner engagement and retention. This aligns with Vygotsky’s (1978) theory of the Zone of Proximal Development, which posits that learners benefit most from tasks that are slightly beyond their current ability when appropriate supports are in place.

Furthermore, the statistically significant increase in numeracy performance reinforces the conclusions drawn by Tomas and Lasaten (2020), who found that modular interventions—when contextually relevant and curriculum-aligned—can lead to substantial gains in students’ mathematical competence. Their research emphasized that differentiated and standards-based modules enhance students’ problem-solving skills and computational fluency by providing focused and structured practice tailored to specific learner profiles. These outcomes underscore the importance of integrating pedagogically sound and evidence-based resources into everyday instruction to support learners with varying proficiency levels.

Taken together, the findings of the present study affirm the pedagogical value of enhanced mathematics modules as a viable and effective intervention for strengthening foundational numeracy, particularly in early grade levels where the development of core mathematical competencies is critical.

Conclusions

Based on the findings, using enhanced mathematics modules as an instructional intervention significantly improved the mathematical competency of Grade 4 learners compared to traditional instruction alone. The statistically significant difference in post-test scores

between the control and experimental groups confirms that enhanced modular learning can effectively address deficiencies in numeracy, particularly in foundational topics such as the addition and subtraction of fractions. This outcome highlights the potential of targeted instructional materials to improve learner outcomes when they are systematically implemented and aligned with students' learning needs.

In response to this conclusion, it is recommended that enhanced modular learning be formally integrated into the existing elementary mathematics curriculum. This integration should begin with curriculum mapping to ensure alignment of the modules with the Department of Education's Most Essential Learning Competencies (MELCs), thereby maintaining coherence with national educational standards. Furthermore, the development of differentiated modules should be prioritized to cater to the diverse proficiency levels of learners, guided by diagnostic data from pre-assessments. Teachers must receive targeted professional development on facilitation strategies, formative assessment techniques, and differentiated instruction practices to effectively implement the modules. Additionally, a monitoring and evaluation system must be established to track student progress through pre- and post-assessment measures, allowing for regular review and enhancement of module content based on data-driven insights and teacher feedback. Parental involvement should also be actively encouraged by providing orientation sessions and module usage guides to support home-based learning, particularly in mathematical areas where learners commonly struggle, such as fraction operations. Through these measures, integrating enhanced modules into the curriculum can help ensure equitable learning outcomes and offer sustained support to learners needing structured, focused instruction.

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