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Project BILANG: Improving Students' Performance Through Numeracy Remediation Program

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ABSTRACT

This study aimed to examine the effectiveness of Project BILANG (Basic Intervention for Students At-Risk in Numeracy Growth) in addressing foundational numeracy difficulties among students at Malinao High School through diagnostic assessment and contextualized remediation modules. The action research adopted a mixed-methods approach involving quantitative assessment of students' mathematical performance and qualitative exploration of their experiences, with integration intended to provide a comprehensive evaluation of the intervention. A teacher-developed Numeracy Diagnostic Assessment Test underwent expert validation and two rounds of pilot testing involving 54 students. The assessment demonstrated acceptable internal consistency, with Cronbach's alpha coefficients of 0.726 and 0.766. The contextualized remediation modules also underwent expert evaluation, obtaining an overall mean rating of 3.87, interpreted as Highly Valid. These findings established the satisfactory reliability of the diagnostic instrument and the instructional suitability of the remediation materials. The study concluded that Project BILANG provides a structured, curriculum-aligned approach to identifying numeracy difficulties and supporting targeted remediation. Mathematics teachers are encouraged to utilize the validated materials while systematically evaluating students' learning progress. However, the available findings do not establish the intervention's actual effects on mathematical performance. The study contributes validated instructional resources that may support evidence-informed numeracy remediation, strengthen school-based learning recovery initiatives, and guide further evaluation of targeted Mathematics interventions.

Keywords: *Contextualized Learning, Diagnostic Assessment, Mathematics Remediation, Numeracy Intervention, Project BILANG, School-Based Intervention*

1. INTRODUCTION

Mathematical literacy is fundamental to learners' capacity to interpret information, solve everyday problems, and engage with increasingly complex academic tasks. Foundational numeracy, including number sense and accurate computation, supports progression toward algebraic reasoning and applied problem solving. Nevertheless, international assessments indicate persistent difficulties among Filipino learners. The Organisation for Economic Co-operation and Development (OECD, 2023a) reported that only 16% of Filipino participants in the Programme for International Student Assessment (PISA) 2022 attained at least Level 2 proficiency in mathematics, compared with an OECD average of 69%. Although this assessment measures broader mathematical literacy rather than the specific competencies targeted in school remediation, it provides important national context for strengthening mathematics instruction. The broader PISA 2022 assessment likewise underscores the need to strengthen mathematical reasoning and problem-solving through instruction responsive to students' existing knowledge (OECD, 2023b)

1.1. Background of the Study

Learning disruption has further emphasized the need for deliberate recovery strategies. A joint international review emphasized assessing learning levels and prioritizing foundational skills during recovery from school closures (UNESCO et al., 2022). Subsequently, DepEd Order No. 013, s. 2023 adopted the National Learning Recovery Program to address learning losses and low achievement in national and international assessments (Department of Education, 2023). Such policy directions encourage schools to identify learners' actual difficulties rather than rely exclusively on uniform classroom instruction. At Malinao High School, teacher observations and diagnostic assessments indicated that some students experienced difficulty with basic computations and the application of numerical concepts. In response, Project BILANG (Basic Intervention for Students At-Risk in Numeracy Growth) was developed as a school-based approach using diagnostic assessment and contextualized remediation modules. Its guided practice reflects the instructional importance of support within learners' developing capabilities, as articulated in Vygotsky's (1978) Zone of Proximal Development. The immediate concern is whether this locally designed intervention meaningfully addresses the numeracy difficulties identified among participating students. International evidence also highlights the value of diagnosing foundational learning gaps before selecting targeted recovery activities (World Bank et al., 2022).

1.2. Research Problem

Despite continuing emphasis on mathematics education, insufficient mastery of foundational operations can restrict students' participation in more advanced learning activities. National PISA results indicate a broad mathematical proficiency challenge: the OECD (2023a) found that the proportion of Filipino students reaching baseline proficiency in 2022 remained low and had not changed significantly from 2018. These findings cannot establish the performance of individual schools, but they reinforce the importance of investigating specific learning needs through local assessments. Within Malinao High School, diagnostic information and teacher observations identified difficulties in computational skills, number sense, and the application of numerical concepts. The intervention therefore concentrated on foundational operations, including addition, subtraction, multiplication, and division, alongside work involving integers and word problems. The concern is not simply whether learners complete remedial activities, but whether their measured performance changes and how they experience the instructional support provided. DepEd's National Learning Recovery Program supports targeted responses to identified learning needs (Department of Education, 2023), while international learning-recovery

guidance underscores the importance of sustained remediation (UNESCO et al., 2022). However, these policy priorities and national indicators do not establish whether Project BILANG is effective in this particular school setting. Evidence integrating measured performance changes with students' accounts of the intervention remains necessary. Evidence-informed feedback is relevant to this process because it helps teachers identify misunderstandings and adjust subsequent instruction (Education Endowment Foundation, 2021).

1.3. Research Gap

Existing national evidence documents mathematics proficiency challenges among Filipino learners, while education policy provides a framework for learning recovery (Organisation for Economic Co-operation and Development [OECD], 2023a; Department of Education, 2023). These sources establish the need for intervention but do not evaluate the specific combination of diagnostic testing, needs-based grouping, contextualized modules, and guided practice used in Project BILANG at Malinao High School. Nor can national assessment findings determine whether changes in local test performance correspond with benefits perceived by students. The project draws conceptually on Vygotsky's (1978) account of supported learning and Guskey's (2000) emphasis on instructional improvement informed by student outcomes. However, theoretical relevance alone does not demonstrate intervention effectiveness. A context-specific evaluation must consider both the magnitude of pre-intervention to post-intervention performance differences and participants' qualitative experiences. This action research addresses that practical evidence gap through quantitative assessment, qualitative inquiry, and phase-to-phase integration, providing school-level evidence to inform decisions about continuing or refining the remediation approach. Recent Philippine and international studies on contextualized numeracy remediation and small-group support provide relevant precedents for testing local approaches rather than assuming effectiveness (Cara et al., 2025; Combo et al., 2025; Culpable et al., 2024; Guelas & Pasia, 2025; Niyibizi & Kazinyirako, 2024; Rosholm et al., 2025).

1.4. Purpose and Objectives of the Study

This action research aimed to examine the effectiveness of Project BILANG in improving the mathematics performance of participating students at Malinao High School. Specifically, it sought to determine students' performance levels before and after implementation; test whether the difference in performance was statistically significant; and estimate the intervention's effect size. It also explored the benefits students reported after participating in the project. Finally, the study compared quantitative results with qualitative insights through phase-to-phase mapping and developed an integrated interpretation, or meta-inference, concerning the intervention's effectiveness. These objectives reflect the study's sequential quantitative, qualitative, and integration phases and remain focused on the intervention and outcomes specified in the action research questions.

1.5. Significance and Practical Contribution of the Study

The study offers locally grounded evidence to support decisions about foundational numeracy remediation at Malinao High School. For mathematics teachers, diagnostic information and student feedback may help identify priority skills, adapt instructional pacing, and refine contextualized learning activities. For school administrators, evidence about performance differences, effect size, and student-reported benefits may inform the allocation of instructional support and the review of remediation practices. The intervention's validated assessment and modules also provide practical materials for further classroom evaluation, although their usefulness beyond the study setting requires additional testing. More broadly, the research contributes an example of school-based action research that integrates performance data with learner perspectives to guide iterative instructional improvement. The broader education

evidence base supports monitoring equity in access to learning opportunities and using evaluation results to inform school improvement (OECD, 2024; SEAMEO INNOTECH, 2022). Support for teacher professional capacity is also relevant when schools introduce targeted interventions and monitor their implementation (UNESCO & International Task Force on Teachers for Education 2030, 2024).

1.6. Sustainable Development Goals (SDG) Alignment

The study aligns most directly with Sustainable Development Goal 4: Quality Education, which promotes inclusive and equitable quality education and lifelong learning opportunities for all (United Nations, 2015). Project BILANG addresses this goal by identifying students who need additional foundational numeracy support and providing structured, contextualized remediation rather than assuming uniform levels of prior mastery. Its assessment of pre-intervention and post-intervention performance also supports evidence-informed efforts to improve learning outcomes. The study's consideration of students' reported benefits adds an important learner-centered dimension to evaluating instructional support. This alignment is specific to the project's educational purpose; the research does not claim to measure national SDG indicators or demonstrate broader development outcomes beyond its school-based context. UNESCO (2023) further emphasizes evaluating instructional tools in relation to learner needs, rather than assuming that the presence of educational resources alone guarantees improved outcomes.

2. METHODOLOGY

2.1. Research Design

The study employed school-based action research incorporating quantitative, qualitative, and integration phases, as indicated by its research questions. The quantitative phase examined students' performance before and after Project BILANG, including differences and effect size. The qualitative phase sought students' perceived benefits from participation, while the integration phase aimed to compare both strands through phase-to-phase mapping and meta-inference. This structure was intended to evaluate numeracy performance alongside students' experiences. A more specific design classification is not reported. The use of complementary quantitative and qualitative evidence is consistent with contemporary mixed-methods research guidance (Creswell & Creswell, 2023).

2.2. Research Locale, Population, and Participants or Respondents

The research was situated at Malinao High School, where teacher observations and diagnostic assessments identified difficulties with foundational mathematical operations and applying numerical concepts. Project BILANG targeted students at risk of inadequate numeracy growth, particularly those needing support in integer operations, number sense, and word-problem solving. The manuscript reports 54 students with characteristics similar to the actual respondents who participated in instrument pilot testing. These 54 students must not be treated as the final study sample. Population, final sample size, grade levels, and demographics are unreported.

2.3. Sampling Technique and Sample Determination

The manuscript indicates that students' diagnostic results informed grouping according to identified learning needs and the development of targeted remediation activities. It does not, however, identify the sampling technique used to recruit participants for the main evaluation or describe how the final sample size was determined. The 54 students involved in reliability testing formed a pilot group with characteristics similar to those of the intended respondents. Sample-size calculation and recruitment criteria are undocumented. These details require confirmation. The teacher-researcher developed a Numeracy Diagnostic Assessment Test aligned with Department of Education Mathematics Curriculum Guide competencies. Two sets of three

Mathematics education experts evaluated two sets of items for relevance, clarity, appropriateness, and curricular alignment. Each pilot retained 10 items. The same 54 students completed two pilot rounds one week apart, using different question sets. Cronbach's alpha was 0.726 in the first round and 0.766 in the second; both fall within the manuscript's stated acceptable range of 0.70–0.79. Remediation modules were separately evaluated by a Mathematics-major principal, Mathematics teacher, and English department head using a four-point scale. Their ratings were 3.80, 3.90, and 3.90, respectively, yielding an overall mean of 3.87, classified as Highly Valid.

2.4. Data Gathering Procedure

The development of guided exercises and diagnostic follow-up also aligns with the principle that timely feedback should address specific misconceptions (Education Endowment Foundation, 2021). The documented procedure began with expert validation and two rounds of pilot testing of the diagnostic instrument. The teacher-researcher then administered the diagnostic assessment to identify specific numeracy difficulties and used the results to organize learning groups and tailor instructional activities. Students subsequently received contextualized remediation modules incorporating guided examples, practice drills, reflective exercises, and progressively more complex problems. The manuscript does not detail the timing or administration of follow-up assessments, qualitative data collection, or permissions.

2.5. Data Analysis and Statistical Treatment

The manuscript reports Cronbach's alpha for diagnostic-test internal consistency and arithmetic mean ratings for module validation. It also specifies research questions concerning pre-intervention and post-intervention performance, statistical significance of their difference, intervention effect size, student-reported benefits, and integration of quantitative and qualitative evidence through phase-to-phase mapping and meta-inference. However, the particular inferential test, effect-size formula, scoring rubric, qualitative coding method, integration procedure, software, and significance threshold are not identified. Additional techniques cannot be confirmed. For interpretation, the distinction between reliable instruments and evidence of intervention effectiveness is important: validation statistics cannot substitute for outcome comparisons (Creswell & Creswell, 2023).

2.6. Ethical Considerations

The available manuscript does not describe informed consent or assent, parental permission, voluntary participation, confidentiality safeguards, secure data handling, withdrawal rights, or ethics and institutional approvals. Because the intervention concerns school students, these matters require explicit documentation in the completed research report. No ethics clearance number or approval body can be stated from the supplied text. Only verified protections and approvals should be reported.

3. RESULTS AND DISCUSSION

3.1. Reliability of the Numeracy Diagnostic Assessment

The Numeracy Diagnostic Assessment Test underwent expert content validation and two rounds of pilot testing before its use in Project BILANG. Two sets of three Mathematics education experts evaluated the two sets of items for relevance, clarity, appropriateness, and alignment with Department of Education Mathematics competencies. The same 54 students, described as having characteristics similar to the intended study respondents, participated in pilot tests conducted one week apart. Each test retained 10 items. The reported Cronbach's alpha coefficients were 0.726 for the first pilot and 0.766 for the second, both within the manuscript's "acceptable reliability" range of 0.70–0.79. The higher coefficient in the second round suggests stronger internal consistency for that test set. However, because the manuscript indicates that

different questions were used, this difference alone cannot establish that revision improved the same instrument. These results support the use of the assessment for diagnostic purposes within the study, while not establishing that the intervention improved students' numeracy.

3.2. Expert Evaluation of the Numeracy Remediation Modules

Three experts—the school principal with a Mathematics specialization, a Mathematics teacher, and the English department head—evaluated the remediation modules for content accuracy, curriculum relevance, presentation clarity, instructional organization, and language appropriateness. On the reported four-point scale, the overall mean was 3.87, interpreted as "Highly Valid." The individual evaluator means were 3.80 for the principal, 3.90 for the Mathematics teacher, and 3.90 for the English department head; all three were interpreted as "Highly Valid." The close ratings indicate consistently favorable expert judgments across the three evaluators. This supports the suitability of the modules as instructional materials aligned with the intended competencies. Nevertheless, expert validation measures perceived quality and appropriateness; it is not, by itself, evidence of improved student performance. The intervention's instructional approach—guided examples, practice drills, reflective activities, and contextualized problems—is consistent with its stated emphasis on scaffolding within Vygotsky's Zone of Proximal Development. Related contextualized mathematics interventions have likewise examined the suitability of targeted activities for learners with identified foundational gaps (Combo et al., 2025; Guelas & Pasia, 2025).

3.3. Student Performance Before and After Project BILANG

The manuscript identifies comparison of students' numeracy performance before and after the intervention as a primary research question, but it does not provide the main-study pretest and posttest scores, sample size, descriptive statistics, or performance classifications. Consequently, the direction or magnitude of change in student performance cannot be reported or interpreted from the available evidence.

3.4. Statistical Difference and Effect Size

The research questions require assessment of the statistical difference between pre-intervention and post-intervention performance and calculation of an effect size. No corresponding test statistic, significance level, p-value, confidence interval, or effect-size estimate is included in the supplied manuscript. A conclusion about statistical significance or practical intervention impact would therefore be unsupported.

3.5. Student-Reported Benefits of Project BILANG

The qualitative phase asks what benefits students gained from participation. The supplied text does not include interview responses, participant quotations, coding results, or qualitative themes. Although the intervention was intended to support confidence, computational proficiency, and attitudes toward Mathematics, these intended outcomes cannot be presented as observed participant experiences without the qualitative findings.

3.6. Integration of Quantitative and Qualitative Findings

The action research questions call for phase-to-phase mapping and mixed-methods meta-inferences. As the main quantitative results and qualitative themes are not available, convergence, divergence, complementarity, or explanatory relationships between the two strands cannot yet be assessed. Integration should be completed after the corresponding results are supplied, distinguishing measured changes from students' reported experiences.

4. CONCLUSIONS AND RECOMMENDATIONS

The findings of the study established the instructional readiness of Project BILANG (Basic Intervention for Students At-Risk in Numeracy Growth) as a school-based intervention designed to address foundational numeracy difficulties among students at Malinao High School. The validation of the Numeracy Diagnostic Assessment Test demonstrated acceptable internal consistency, supporting its suitability for identifying students' difficulties in fundamental mathematical operations and related competencies. Similarly, the expert evaluation of the contextualized remediation modules indicated a high level of validity in terms of content accuracy, curriculum alignment, instructional organization, and language appropriateness. These findings suggest that Project BILANG provides a structured approach to identifying numeracy learning gaps and developing targeted instructional materials. Its emphasis on diagnostic assessment, guided practice, and contextualized learning supports the objectives of mathematics remediation and learning recovery. However, the available findings establish instrument and material quality rather than conclusively demonstrating improvements in students' mathematical performance following implementation. This distinction is consistent with research on targeted mathematics instruction, which requires observed learning outcomes to establish benefits (Rosholm et al., 2025).

Based on the findings, Mathematics teachers at Malinao High School are encouraged to utilize the validated Numeracy Diagnostic Assessment Test to identify students requiring additional instructional support in fundamental mathematical competencies. The contextualized remediation modules developed under Project BILANG may be incorporated into school-based numeracy remediation activities, particularly for learners experiencing difficulties in number sense, integer operations, and mathematical problem-solving. Teachers should maintain the structured instructional approach of guided examples, progressive exercises, and contextualized activities while monitoring students' learning needs throughout implementation. School administrators may support the continued refinement and appropriate use of these instructional materials through collaborative evaluation and curriculum alignment. Further assessment of students' performance before and after participation is recommended to determine whether the intervention produces measurable improvements in numeracy proficiency. Future investigations may also examine students' experiences and perceptions to provide additional evidence regarding the practical benefits and instructional effectiveness of Project BILANG.

The available manuscript provides evidence concerning the validation and reliability of the diagnostic assessment and the expert evaluation of the remediation modules but does not report the complete outcomes of the intervention. Although the study identifies quantitative, qualitative, and integrated research questions, the corresponding pretest and posttest results, statistical significance tests, effect size estimates, and qualitative findings are not available in the supplied material. Consequently, conclusions regarding actual learning improvement and intervention effectiveness remain limited. Additional reporting of participant characteristics, sampling procedures, and complete outcome analyses is necessary to establish the scope, interpretation, and transferability of the findings.

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