International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Strategic Intervention Worksheets and Mathematical Proficiency of Grade 1 Learners

Ms. Francia Bristol Marcillano[1], Dr. Juan, Jr. Orande Cruz[2]

[1]Teacher I, DepEd, Naga College Foundation, Inc.
[2]Assistant Professor IV, DepEd, Naga College Foundation, Inc.

Abstract
This study determined the effectiveness of Strategic Intervention Worksheets (SIWs) in enhancing the Mathematics 1 proficiency of Grade 1 learners at Fundado Elementary School, Canaman District, Division of Camarines Sur during the School Year 2025–2026. Using a descriptive-comparative research design, the study involved 34 Grade 1 learners selected through total enumeration and focused on three foundational mathematics areas: simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. The SIWs were systematically developed using the ADDIE instructional design model and implemented based on learners' identified learning gaps. Data were gathered through a validated teacher-made pretest and posttest and analyzed using mean, standard deviation, proficiency level metrics, the Wilcoxon Signed-Rank Test, and Rank Biserial Correlation. Results showed that learners initially demonstrated an Approaching Proficiency level across all three areas, while posttest results indicated improvement to the Proficient level in simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. Statistical analysis revealed a significant difference between pretest and posttest scores, with large effect sizes observed in all domains, particularly in addition skills. The findings conclude that Strategic Intervention Worksheets are effective in improving foundational mathematics proficiency among Grade 1 learners and support the use of structured, theory-based instructional interventions in early mathema lucation.

Keywords: ADDIE model, Mathematics proficiency, Strategic Intervention Worksheets

INTRODUCTION

Background of the Study

As elementary classroom teachers, the researchers observed a recurring pattern in which many Grade 1 learners experienced difficulty in understanding foundational mathematical concepts such as number recognition, counting, whole number operations, and simple problem solving. Despite careful lesson planning, guided practice, and differentiated instruction, these learners consistently demonstrated repeated errors, low engagement, and minimal improvement over time. This situation raised professional concern regarding the effectiveness of regular classroom instruction alone in addressing early mathematics difficulties. It became evident that some learners required more targeted and structured support to develop

confidence and proficiency in early numeracy. Consequently, the researchers were motivated to investigate how strategic intervention could enhance Grade 1 learners' mathematical achievement.

Globally, early mathematics proficiency was recognized as a critical foundation for academic success and lifelong learning, as strong numeracy skills in the early years significantly influenced learners' future performance and problem-solving abilities. Many learners across different countries continued to experience difficulties in acquiring basic mathematical competencies, leading to persistent learning gaps that affected their long-term educational outcomes. This global issue highlighted the need for effective instructional strategies that could address early learning challenges. Research also showed that learners who struggled with numeracy in the early grades often continued to encounter difficulties in higher-level mathematics if no intervention was provided. Thus, addressing these gaps early was essential to ensure better academic progression.

Mathematics intervention was widely recognized as effective in enhancing learners' academic outcomes. For instance, Siegler (2016) emphasized that early number sense was a strong predictor of later mathematics achievement. Similarly, Fuchs et al. (2016) found that systematic and explicit intervention programs significantly improved computation and problem-solving skills among primary learners. Clements and Sarama (2016) highlighted that structured and developmentally appropriate instructional materials enhanced early numeracy learning. In addition, Gersten et al. (2017) reported that targeted interventions were particularly effective for struggling learners in mathematics. Duncan et al. (2017) further confirmed that early mathematical skills were closely linked to long-term academic success. Moreover, Schneider et al. (2017) emphasized that early interventions helped prevent persistent learning difficulties in mathematics. Studies by Dowker (2019) and Mullis et al. (2020) also revealed that learners who received early support demonstrated improved numeracy skills and academic performance. These findings collectively underscored the importance of timely and structured intervention in early mathematics education.

In the Philippine and regional context, several studies conducted from 2016 onwards demonstrated the effectiveness of intervention-based approaches in improving mathematics performance. Bautista (2022) and Mendoza (2020) found that structured intervention materials, such as worksheets and guided activities, significantly improved learners' mastery of basic competencies. Similarly, Lopez and Ramos (2020) and Villanueva (2020) reported that experiential and practice-based strategies enhanced learners' engagement and retention of mathematical concepts. Navarro (2019) and Rivera (2021) emphasized that localized and context-based instruction improved learners' comprehension and application of mathematical skills. Furthermore, Santos et al. (2019), Garcia (2021), and Fuentes (2023) highlighted the importance of learner support systems, including teacher guidance and family involvement, in strengthening academic performance. Studies by Shiwaku and Shaw (2018) and Paton et al. (2019) also underscored the value of structured, school-based interventions in promoting skill development and resilience in learning. These studies collectively affirmed that strategic intervention materials were effective tools in addressing learning gaps and improving educational outcomes.

This concern was directly aligned with the United Nations Sustainable Development Goal (SDG) 4, which aimed to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. SDG 4 emphasized the importance of developing foundational skills, particularly literacy and

numeracy, in early childhood education. It highlighted the need to provide all learners with access to quality learning opportunities that supported their academic growth. Achieving this goal required effective teaching strategies and interventions that supported struggling learners. Therefore, strengthening early mathematics education contributed to the realization of global educational targets.

At the national level, the Philippine education system, through the Department of Education (DepEd), supported the development of early numeracy skills through policies and curriculum reforms. DepEd Order No. 8, s. 2015 emphasized the use of assessment data to guide instruction and provide appropriate interventions for learners who were at risk of not meeting learning competencies. Meanwhile, DepEd Order No. 29, s. 2017 highlighted the importance of strengthening literacy and numeracy skills in the early grades. These policies reinforced the need for teachers to implement targeted instructional strategies to support learners. In addition, the MATATAG Curriculum Framework emphasized mastery of essential competencies, ensuring that learners built a strong foundation in basic subjects such as mathematics.

Furthermore, the MATATAG Curriculum underscored the importance of remediation and intervention in helping learners achieve mastery of essential skills. It promoted the idea that learners needed to develop a solid understanding of fundamental concepts before progressing to more complex topics. This framework encouraged the use of innovative and structured teaching strategies to address learning gaps and supported assessment-driven instruction to ensure that learners received appropriate assistance. As such, it reinforced the importance of implementing effective intervention materials in the classroom.

At the local level, classroom observations in elementary schools revealed that many Grade 1 learners continued to struggle with foundational mathematical skills such as number recognition, counting, understanding whole numbers, and solving simple problems. Despite teachers' efforts in providing guided instruction, differentiated strategies, and remediation activities, some learners still exhibited repeated errors, low engagement, and slow academic progress. These challenges indicated that traditional instruction alone might not have been sufficient to meet the diverse learning needs of learners. There was a clear need for more structured and effective instructional materials that could support learners' understanding. This situation called for the use of strategic intervention approaches to improve learning outcomes.

The implementation of Strategic Intervention Worksheets (SIWs) provided significant benefits to various stakeholders in education. For learners, SIWs offered structured, guided, and engaging activities that enhanced understanding, built confidence, and improved mastery of basic mathematics skills. For teachers, these materials served as effective instructional tools that supported remediation, improved teaching efficiency, and addressed learners' specific needs. For school administrators, SIWs contributed to improved learner performance and supported school-based intervention programs aligned with DepEd policies. For policymakers, the findings provided valuable insights that could guide the development of instructional strategies and strengthen intervention programs aimed at improving early numeracy outcomes. Overall, the study contributed to improving teaching practices, enhancing learner outcomes, and supporting data-driven decision-making in education.

From a theoretical perspective, this study was grounded in the principle that learners who failed to master essential competencies early were likely to experience cumulative learning difficulties in later stages.

Strategic interventions provided scaffolding, guided practice, and alternative explanations that helped learners better understand mathematical concepts. These approaches supported meaningful learning by addressing individual learning gaps and allowed learners to progress at their own pace while ensuring mastery of basic skills. Thus, the use of strategic intervention was both theoretically sound and educationally effective.

The significance of this study lay in its contribution to learners, teachers, school administrators, and policymakers. For learners, the study provided evidence-based support that enhanced foundational mathematics skills, leading to improved academic performance and increased confidence in learning. For teachers, it offered practical and research-based instructional strategies that could be used to effectively address learning gaps and improve classroom instruction. For school administrators, the findings served as a basis for strengthening intervention programs and improving school performance outcomes. For policymakers, particularly the Department of Education, the study provided valuable insights that could inform the development of policies and programs aimed at improving early numeracy education.

The rationale for this study lay in the persistent need to address early mathematics learning gaps through effective and evidence-based interventions. Grade 1 mathematics proficiency was critical as it served as the foundation for future academic success, making early intervention essential in preventing long-term learning difficulties. Despite existing instructional strategies, there remained a need to explore and validate approaches that could effectively enhance learners' understanding and performance in mathematics. This study aimed to determine the effectiveness of Strategic Intervention Worksheets in improving foundational mathematics skills, thereby contributing empirical evidence that could guide teachers, support instructional planning, and inform educational policy. Ultimately, this research sought to strengthen early mathematics education and support the goal of providing inclusive, equitable, and quality learning for all learners.

Research Objectives

The study determined the effects of strategic intervention worksheets on the Mathematics Proficiency of grade 1 learners at Fundado, Elementary School, Canaman District, Division of Camarines . Specifically, it achieved the following objectives:

1. To determine is the status of learners' proficiency in Mathematics 1 along, Simple 2-dimensional shapes and their features, whole numbers up to 100,and addition of numbers with sums up to 20.

2. To develop a strategic intervention worksheet.

3. To assess the level of learners' proficiency in Mathematics 1 along, Simple 2-dimensional shapes and their features, whole numbers up to 100,and addition of numbers with sums up to 20 after the use of strategic intervention worksheets.

4. To test if there a significant difference between the level of learners' proficiency in Mathematics before and after using strategic intervention worksheets.

5. To assess the effectiveness of strategic intervention worksheets in enhancing the proficiency of learners in Mathematics.

Scope and Delimitations

The study determined the effectiveness of strategic intervention worksheets on the Mathematics Proficiency of grade 1 learners at Fundado, Elementary School, Canaman District, Division of Camarines during the School Year 2025–2026.

Specifically, the study investigated the learners' proficiency in Simple 2-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. Based on the identified gaps, the researchers developed strategic intervention worksheets using the ADDIE Model and implemented them to enhance learners' understanding and mastery of the targeted topics. The study also assessed learners' proficiency after using the worksheets, examined whether there was a significant difference between pretest and posttest scores, and evaluated the overall effectiveness of the strategic intervention worksheets in improving learners' performance. The study focused on 34 Grade 1 learners, who were selected through total enumeration and served as the respondents. It employed a descriptive-comparative research design to examine learners' proficiency in Mathematics 1 and to determine the impact of the strategic intervention worksheets on their performance.

The study excluded several topics and competencies to maintain focus on its specific objectives. It did not include the measurement of length and distance using non-standard units, place value in any 2-digit number, addition of numbers with sums up to 100, and the use of pictographs without a scale for data representation. It also excluded subtraction of numbers where both numbers are less than 100, repeating patterns, and basic fractions such as 1/2 and 1/4. In addition, the study did not cover the denominations and values of Philippine coins and bills up to ₱100, as well as addition and subtraction of money involving amounts up to ₱100. Furthermore, it excluded topics on the movement of objects in half turns or quarter turns in clockwise or counterclockwise directions, and the measurement of time in hours, half hours, quarter hours, days, weeks, months, and years. These exclusions were made to ensure that the study remained focused on the selected learning competencies aligned with its scope.

Assumptions

This study was guided by the following assumptions:

1. The mathematics proficiency of grade 2 learners along simple 2-dimensional shapes and their features, whole numbers up to 100,and addition of numbers with sums up to 20 varied before and after the use of strategic intervention worksheets.
2. The module can be systematically and effectively developed using the ADDIE instructional design model, ensuring alignment of objectives, content, activities, and assessment with the learning needs of the students.

Hypotheses

This study was anchored on the following hypotheses:

Objective: To test if there a significant difference between the level of learners' proficiency in Mathematics before and after using strategic intervention worksheets.

Ho. There is no significant difference between the level of learners' proficiency in Mathematics before and after using strategic intervention worksheets.

Ha: There is a significant difference between the level of learners' proficiency in Mathematics before and after using strategic intervention worksheets.
Objective: To measure the effectiveness of strategic intervention worksheets in enhancing the proficiency of learners in Mathematic**s.**

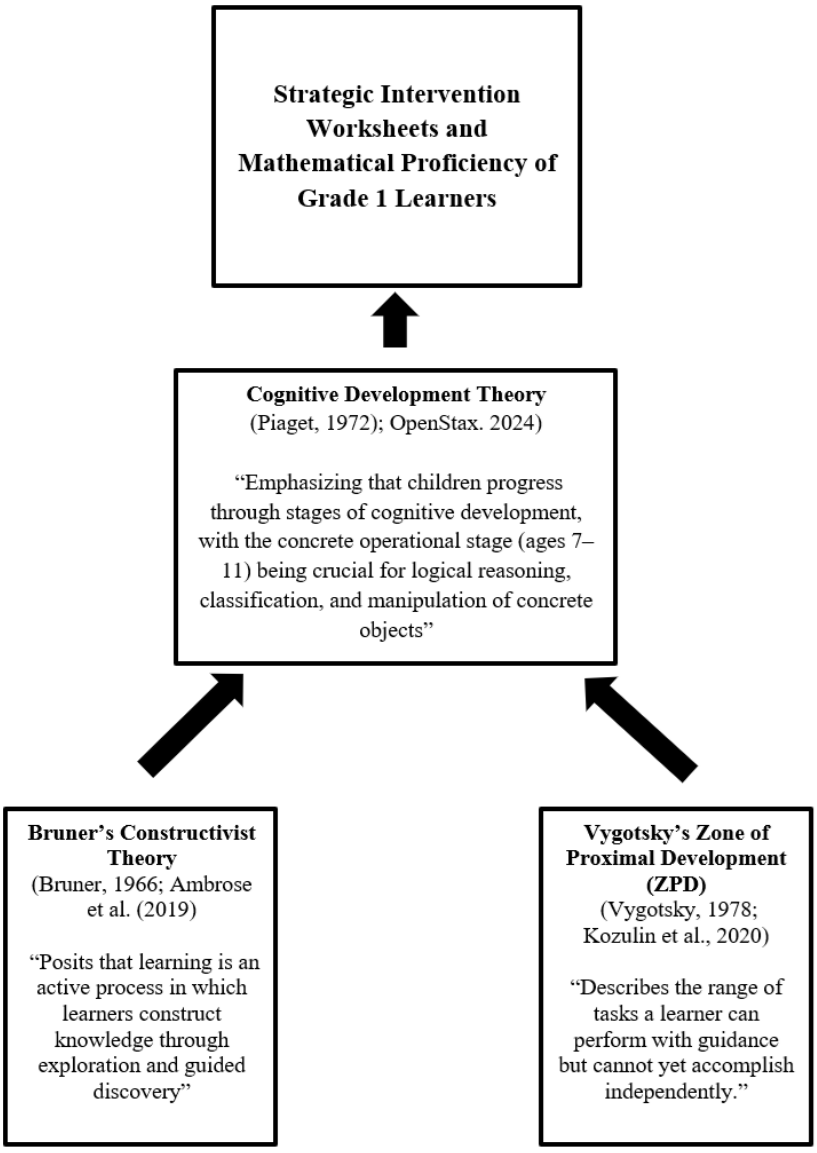
Ho: The strategic intervention worksheets are not effective in enhancing the proficiency of learners in Mathematics
Ha: The strategic intervention worksheets are effective in enhancing the proficiency of learners in Mathematics

Theoretical Framework

This study was anchored on Piaget's Cognitive Development Theory (Piaget, 1972, as cited by OpenStax, 2024), Bruner's Constructivist Theory (Bruner, 1966, as cited by Ambrose et al., 2019), Vygotsky's Zone of Proximal Development (ZPD) Theory (Vygotsky, 1978, as cited by Kozulin et al., 2020), and the ADDIE Model (Molenda, 2015, as cited by Branch, 2021**).** The interrelationship of these theories is illustrated in Figure 1.
Cognitive Development Theory. Cognitive Development Theory was originally proposed by Jean Piaget (1972), who emphasized that children actively construct knowledge through interaction with their environment and progress through distinct stages of cognitive development, particularly the concrete operational stage (ages 7–11), where logical thinking, classification, and the manipulation of concrete objects develop. As cited by Aunio et al. (2023), recent scholarship continues to support Piaget's framework in early mathematics education, highlighting that learners develop numerical understanding most effectively through active, hands-on, and experience-based learning. These findings reinforce the importance of structured and interactive activities in promoting cognitive development and mathematical understanding among young learners.
In the context of this study, Cognitive Development Theory supports the use of Strategic Intervention Worksheets (SIWs) as an effective instructional tool for Grade 1 learners. The SIWs provide structured, concrete, and guided activities that allow learners

Figure 1

Theoretical Paradigm



to actively engage with mathematical concepts such as addition, number sequencing, and shape recognition.

Through these activities, learners are able to construct their own understanding, organize knowledge, and develop logical reasoning skills consistent with Piaget's theory. The worksheets serve as concrete learning experiences that help bridge the gap between abstract concepts and tangible understanding. Thus, the SIWs align with Cognitive Development Theory by promoting meaningful learning and enhancing learners' mathematics proficiency through active engagement and structured cognitive development.

Bruner's Constructivist Theory. Constructivist Theory was originally introduced by Jerome Bruner (1966), as cited by Ambrose et al. (2019), who emphasized that learning is an active process in which learners construct knowledge through exploration and guided discovery. The theory highlights key principles such as scaffolding and the spiral curriculum, where learners revisit concepts at increasing levels of complexity to deepen understanding over time. As cited by Ambrose et al. (2019), this approach supports the idea that meaningful learning occurs when learners are actively engaged and supported in building connections between new and prior knowledge.

In this study, Constructivist Theory supports the use of Strategic Intervention Worksheets (SIWs) as an effective instructional approach for Grade 1 learners. The SIWs provide structured, guided, and interactive activities that allow learners to explore 2-dimensional shapes, manipulate numbers, and solve addition problems using visual and concrete materials. Through these experiences, learners are able to actively construct their own understanding by connecting new concepts to prior knowledge. The use of scaffolding within the worksheets helps learners gradually develop skills and move toward higher levels of understanding and proficiency. Thus, the SIWs align with Constructivist Theory by promoting active learning, meaningful engagement, and the development of mathematical proficiency.

Vygotsky's Zone of Proximal Development (ZPD). This theory was originally conceptualized by Lev Vygotsky (1978), as cited by Kozulin et al. (2020), and describes the range of tasks that a learner can perform with guidance but cannot yet accomplish independently. This theory emphasizes the importance of social interaction, guidance, and scaffolding in supporting learners as they develop new skills and knowledge. As cited by Kozulin et al. (2020), recent scholarship continues to affirm the relevance of ZPD in early education, highlighting that scaffolded instructional support significantly enhances learning and cognitive development. These insights underscore the role of guided learning in helping learners bridge the gap between their current abilities and potential development.

In the context of this study, Vygotsky's ZPD supports the use of Strategic Intervention Worksheets (SIWs) as effective scaffolded learning tools for Grade 1 learners. The SIWs provide guided and structured activities that help learners accomplish tasks such as composing shapes, sequencing numbers, and performing addition with support from the teacher or instructional materials. Through these scaffolded experiences, learners are able to gradually move from assisted performance to independent mastery within their ZPD. The worksheets serve as a bridge between what learners can do independently and what they can achieve with guidance, thereby promoting deeper understanding. Thus, the SIWs align with Vygotsky's ZPD by fostering supported learning, improving confidence, and enhancing learners' mathematics proficiency.

Conceptual Framework

The conceptual flow begins with establishing the core mathematical proficiency constructs for Grade 1 learners: simple 2-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. These three domains define the baseline knowledge and targeted growth

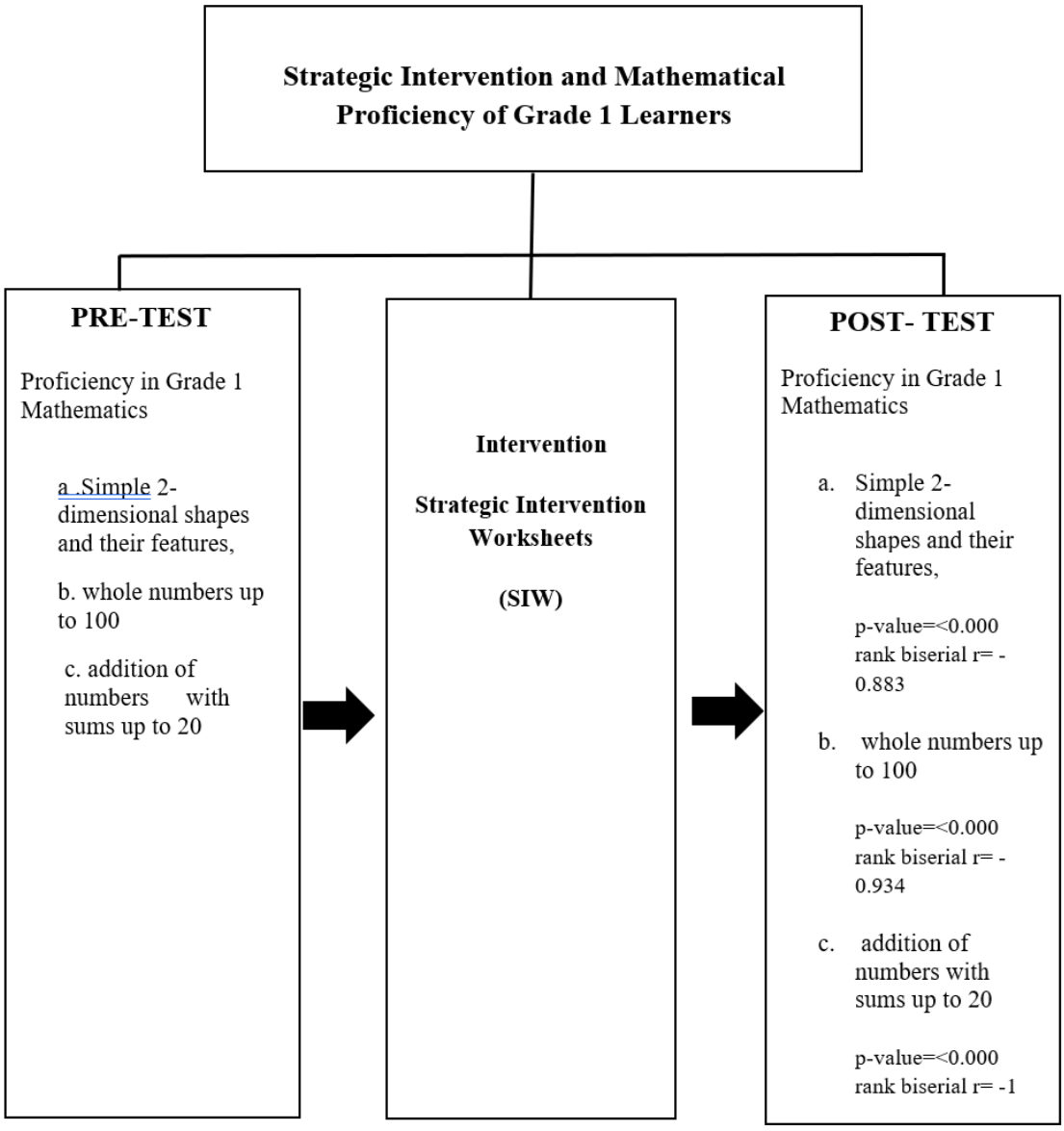
areas that the intervention aims to influence. By framing the study around these specific competencies, the paradigm moves from a broad sense of "math readiness" to a focused, measurable set of skills. This clarity enables precise alignment between instructional strategies (the intervention) and the learning outcomes (the pre-test and post-test measures), ensuring that the assessment truly captures the impact of the interventions on foundational numeracy.

Next, the paradigm proceeds to a comparative assessment phase, using a pre-test to establish each learner's starting point across the three proficiency areas. The reported p-values ($p = 0.000$ for all areas) indicate statistically significant baselines, underscoring the presence of measurable differences in learners' initial proficiency. The rank biserial correlations (a. $r = -0.883$, b. $r = -0.934$, c. $r = -1$) provide an effect-size lens on the strength and direction of associations between the pre-test statuses and subsequent changes, signaling substantial relationships that justify the need for targeted interventions. This phase embodies the theory-to-practice bridge: diagnose where learners are, determine the magnitude of need, and justify the design of focused instructional supports.

The third component of the conceptual flow is the intervention itself, a structured program designed to enhance strategic intervention and mathematics proficiency in the identified domains. Although the image emphasizes pre- and post-test comparisons, the implied model hinges on deliberate, evidence-informed instructional moves—such as

Figure 2

Conceptual Paradigm



multiple representations, guided practice, and metacognitive strategies—that are expected to yield gains in the post-test outcomes. The two-column layout with arrows linking corresponding domains signifies a causal logic: if the intervention is implemented with fidelity, learners should demonstrate improved performance from pre-test to post-test, thereby validating the theoretical premise that targeted strategies lift foundational math skills.

Finally, the paradigm culminates in an evaluative synthesis that interprets the observed shifts as evidence of intervention effectiveness and implications for practice and policy. The post-test results, when read alongside the significant pre-test statistics, suggest a positive trajectory in mathematical proficiency, supporting the argument for scaling targeted strategic interventions within Grade 1 and similar contexts. This synthesis translates statistical findings into actionable insights for classroom practice, curriculum planning, and educational governance (for example, informing DepEd guidelines and SDG-aligned quality education goals), while also acknowledging the need for ongoing monitoring, replication, and refinement to ensure sustained gains across diverse learner populations.

Definition of Terms

This section defines the key terms used in the study both conceptually and operationally to provide a clear and consistent understanding of how each term is defined and applied within the research. The definitions are based on their conceptual meaning from literature and their operational use in the study to ensure clarity and avoid ambiguity in interpretation.

Mathematical Proficiency Level. This refers to a structured framework for evaluating an individual's knowledge, skills, and abilities in a specific subject area or task. It provides descriptive categories that indicate the degree to which learners have demonstrated mastery of the required competencies at a given point in time. Proficiency levels are used in educational settings to identify learners' strengths and areas for improvement, guide instructional planning, and support targeted interventions and remedial strategies (DepEd Order No. 8, s. 2015; DepEd Order No. 31, s. 2012). According to the Department of Education's grading guidelines, learners are classified into five levels of proficiency and corresponding numerical equivalents, ranging from Beginning (B) to Advanced (A). Specifically, Beginning describes learners who have not yet acquired the prerequisite knowledge and skills, while Developing indicates learners who possess minimum understanding but still require assistance; Approaching Proficiency reflects learners who can transfer understanding with some guidance, Proficient denotes independent transfer of skills, and Advanced describes learners who exceed core requirements and apply skills flexibly and automatically through performance tasks (DepEd Order No. 31, s. 2012).In this study, proficiency level refers to the classification of Grade 1 learners' performance in Mathematics 1 specifically, on Simple 2-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20, by assigning learners to one of the five proficiency levels (Beginning, Developing, Approaching Proficiency, Proficient, and Advanced) based on their numerical test scores. These classifications serve as measurable benchmarks for determining students' competence in the targeted topics before and after the implementation of the strategic intervention worksheets, thereby providing a basis for assessing learning progress and instructional effectiveness

Simple 2-dimensional shapes and their features. These are flat geometric figures that have length and width but no depth and can be identified, compared, and analyzed based on their defining attributes. Common examples include triangles, rectangles, and squares, which are distinguished by the number of sides and corners (vertices) they possess. For instance, a triangle has three sides and three vertices, a rectangle has four sides with opposite sides equal and four right angles, and a square has four equal sides and four right angles (Van de Walle et al., 2019; National Council of Teachers of Mathematics [NCTM], 2014). Understanding these features enables learners to compose (combine) and decompose (break apart) shapes, supporting the development of spatial reasoning and foundational geometry skills (Clements & Sarama, 2014).As used in this study, simple two-dimensional shapes and their features include: (1) identifying triangles, rectangles, and squares of different sizes and orientations; (2) comparing and distinguishing these shapes based on sides and corners; and (3) composing and decomposing triangles, squares, and rectangles in various configurations.

Whole numbers up to 100. Whole numbers up to 100 refer to the set of non-negative integers from 0 to 100, which form the basis of early number sense and counting skills. This concept includes counting forward and backward within 100, identifying numbers that are one more or one less than a given number, and recognizing numerical order and magnitude (DepEd, 2016; Common Core State Standards Initiative

[CCSSI], 2010). Mastery of whole numbers up to 100 supports learners' understanding of place value, numerical relationships, and later arithmetic operations. As used in this study, whole numbers up to 100 involve learners' ability to count, compare, and identify numbers within this range as part of their foundational Mathematics 1 competencies.

Addition of numbers with sums up to 20. Addition of numbers with sums up to 20 involves the process of combining two or more quantities to determine a total, using concrete, pictorial, and symbolic representations. This concept emphasizes understanding addition as "putting together" or "counting on", rather than rote memorization of facts (Van de Walle et al., 2019). Learners apply key properties of addition, such as the identity property (adding zero does not change a number) and the commutative property (changing the order of addends does not affect the sum), and solve simple oral or visual problems within this numerical range (NCTM, 2014; DepEd, 2016).As used in this study, addition with sums up to 20 includes using objects, drawings, and number sentences to represent and solve addition problems accurately and meaningfully.

Strategic Intervention Worksheet. This refers to a purposefully designed instructional material that is aligned with specific learning objectives, curriculum standards, and principles of cognitive development. Unlike traditional worksheets that primarily focus on rote practice and repetitive drills, strategic worksheets integrate scaffolded learning tasks, visual representations, guided problem-solving activities, and formative assessment components to promote conceptual understanding and skill mastery. According to Branch (2009) and Tomlinson (2017), instructional materials are considered strategic when they are systematically designed to address learners' needs, provide structured support, and gradually lead learners toward independent performance. Such worksheets support differentiated instruction by offering step-by-step guidance, varied levels of difficulty, and opportunities for feedback and reflection, thereby enhancing learner engagement and learning effectiveness. As utilized in this study, this refers to the teacher-developed instructional worksheets designed using the ADDIE Model, specifically intended to improve Grade 1 learners' proficiency in simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20.

METHODOLOGY

This section presents the methodology of the study, describing the research design, respondents of the study, research instruments, data gathering procedures, and data analysis techniques employed to determine the effectiveness of the strategic intervention worksheets in enhancing the Mathematics 1 proficiency of Grade 1 learners, particularly in simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20.

Research Design

The study employed a descriptive-comparative research design. The descriptive method was utilized to examine the performance of Grade 1 learners in Mathematics 1, focusing on assessing their baseline proficiency in simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. It was also used to describe the development of the Strategic Intervention Worksheets using the ADDIE Model and to evaluate learners' performance after the intervention. Descriptive analysis provided detailed information on learners' strengths, weaknesses, and learning

patterns, which informed the design and refinement of the worksheets to ensure alignment with the learners' needs. Several studies have successfully used descriptive analysis to identify learning gaps before implementing interventions. For example, Nelson et al. (2024) analyzed first-grade learners' early numeracy skills prior to structured interventions, while Bryant et al. (2008) documented foundational mathematics difficulties to guide targeted instructional strategies. These studies highlight the importance of understanding learners' starting points to create effective and developmentally appropriate instructional materials.

On the other hand, the comparative method was utilized to evaluate the significant differences between learners' pretest and posttest scores and to determine the overall effectiveness of the developed Strategic Intervention Worksheets in enhancing mathematics performance. Comparative analysis allowed for a rigorous assessment of learning gains, showing whether the intervention had a measurable impact on learners' understanding and application of mathematical concepts. Previous research demonstrates the effectiveness of this approach; for instance, Khan (2017) compared pretest and posttest results to measure the effectiveness of instructional modules in mathematics, while Salazar and Caballero (2020) validated learner-centered modules and demonstrated significant improvements in student learning outcomes. Through comparative analysis, the study quantified the practical benefits of the worksheets, providing objective evidence of their impact on learners' proficiency.

By integrating both descriptive and comparative methods, the study offered a comprehensive evaluation of the effectiveness of the Strategic Intervention Worksheets. The descriptive component identified learners' baseline competencies, informed the design of the worksheets, and highlighted specific areas needing support. The comparative component measured improvements and validated the worksheets as an evidence-based instructional tool.

Respondents of the Study

The study involved 34 Grade 1 learners from Fundado Elementary School for the School Year 2025–2026. It employed total enumeration in determining the respondents, including the entire population of Grade 1 learners to ensure comprehensive data collection and to avoid sampling bias. Total enumeration is particularly suitable for educational research where the population is small, accessible, and manageable, as in this case. Similar approaches have been successfully applied in previous studies on early mathematics interventions, such as those by Nelson et al. (2024), Bryant et al. (2008), and Sekaran and Bougie (2016), which investigated the effectiveness of targeted instructional strategies in early numeracy.

Using total enumeration allowed the study to assess the learners' proficiency across three key areas: simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20, ensuring that every learner's baseline and post-intervention performance were captured. The Strategic Intervention Worksheets were developed using the ADDIE instructional design model, providing a systematic, learner-centered, and evidence-based approach to instruction. The effectiveness of the worksheets was evaluated through pretest and posttest assessments, which measured both improvements in proficiency levels and the practical application of foundational mathematical concepts (Branch, 2009; Molenda, 2015; Reiser & Dempsey, 2018).

Research Instrument

The researcher used a validated teacher made test through item analysis and the questionnaire as data gathering tools.

Teacher made-test. This instrument was employed to determine the strengths and weaknesses of the Grade 1 learners in Mathematics 1. To ensure that the assessment accurately measured the intended learning outcomes, a Table of Specifications (TOS) was constructed, aligning test items with the cognitive levels of Bloom's Taxonomy, including knowledge, comprehension, application, and analysis (Anderson & Krathwohl, 2001). This ensured a balanced representation of topics such as simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. Prior to formal administration, a dry run of the test was conducted with a small group of learners to identify unclear items, determine the appropriate time for completion, and provide preliminary data for item analysis.
Item analysis involved calculating the Index of Difficulty (p-value) to determine whether each item was appropriately challenging, and the Index of Discrimination (D-value) to assess how well each item distinguished between high- and low-performing learners (Ebel & Frisbie, 1991; Crocker & Algina, 2006). Items that were too easy, too difficult, or poorly discriminating were revised or removed. The test was further evaluated for content and construct validity, ensuring that it effectively measured the intended mathematical skills and concepts. Reliability was assessed using Cronbach's alpha, confirming the consistency and dependability of the results (Ary, Jacobs, & Sorensen, 2010). This rigorous process ensured that the teacher-made test served as a valid and reliable tool for diagnosing learners' mathematical proficiency and guiding the development of the Strategic Intervention Worksheets.

Procedures of Investigation

In this section, data were systematically collected through securing permission, selecting respondents, validating instruments, and administering the research tools to evaluate the effectiveness of the Strategic Intervention Worksheets in improving Grade 1 learners' Mathematics proficiency.

Permission to Conduct the Study**.** Formal permission to conduct the study was obtained from the school head of Fundado Elementary School to ensure compliance with institutional policies and ethical standards. A formal request was also submitted to the principal to obtain the official list of Grade 1 learners for School Year 2025–2026.

Selection of Respondents**.** The study included all 34 Grade 1 learners through total enumeration. This approach ensured that the entire population was represented, allowing for complete and unbiased data collection.

Preparation and Validation of Instruments**.** The Strategic Intervention Worksheets (SIWs) and teacher-made pretest and posttest were developed based on the K to 12 Mathematics 1 curriculum and DepEd competencies. These instruments were validated by the adviser and subject-matter experts to ensure content validity, clarity, and appropriateness. A dry run was conducted with a group of learners outside the sample to refine instructions and improve the reliability of the instruments.

Administration of Instruments. The validated pretest was administered to assess the learners' baseline proficiency in Mathematics. The SIWs were then implemented as the main intervention over a specified period. After the intervention, the posttest was administered to measure the learners' learning gains and

determine the effectiveness of the intervention. Throughout the process, observations of learners' engagement, participation, and performance were recorded to support the collected data.

Ethical Considerations

In conducting this study, the researchers ensured that all procedures adhered to ethical principles and standards set by the Department of Education (DepEd) and general research ethics for studies involving minors. Special attention was given to protecting the rights, welfare, and well-being of the Grade 1 learners, as well as ensuring parental involvement, voluntary participation, confidentiality, and academic integrity. Ethical safeguards were implemented throughout the research process to maintain a safe, supportive, and transparent environment for all participants.

Permission to Conduct the Study. Formal permission to conduct the study was obtained from the school head of Fundado Elementary School. Approval was also secured from the school administration and grade-level coordinators to ensure compliance with DepEd policies and ethical standards governing research involving learners.

Parental/Guardian Consent. Prior to the implementation of the study, written consent was obtained from the parents or legal guardians of all Grade 1 learners. Parents were fully informed of the purpose, objectives, procedures, and potential benefits of the study and were assured that their children's participation was voluntary and would not affect their academic standing.

Informed Assent of Learners. Age-appropriate explanations regarding the study's activities were provided to the learners. They were informed that their participation was voluntary, and that they could withdraw at any time without any negative consequences on their grades or classroom participation.

Voluntary Participation. Participation in the study was entirely voluntary. No coercion or undue influence was applied, and learners' decisions regarding participation had no effect on their academic evaluation in Mathematics 1.

Confidentiality and Privacy. The personal and academic information of all respondents was treated with strict confidentiality. Each learner was assigned a unique identification code, and all records, including test scores and worksheet results, were securely stored to prevent unauthorized access. Data were used solely for the purposes of this study.

Non-Maleficence. The study was designed to prevent psychological, academic, or social harm. All tests, Strategic Intervention Worksheets, and learning activities were conducted in a supportive, age-appropriate environment, promoting positive engagement, confidence, and minimal stress among the learners.

Academic Integrity. All aspects of the study including the development of worksheets, testing procedures, data analysis, and reporting were conducted following principles of honesty, transparency, and scholarly rigor. All sources were verified, and proper attribution was given to all references, curricular documents, and contributors.

Responsible Use of AI Tools. Generative AI tools, specifically Liner for search aggregation and ChatGPT for content synthesis, were used solely to assist in organizing and drafting textual material. All AI-generated content was manually verified by the researchers to ensure accuracy, relevance, and proper citation. The use of these tools was fully disclosed to maintain transparency and uphold academic integrity.

Data Analysis Techniques

The following statistical techniques were employed to analyze the collected data and derive meaningful insights regarding the research objectives. These methods were selected to systematically examine the relationships between the variables, quantify the impact of specific practices, and determine the overall distribution of responses

Mean. The mean was used to determine the average score and overall academic performance of the Grade 1 learners. According to Gravetter et al. (2021), the mean is an essential measure of central tendency that provides a summary of learners' performance levels in educational assessments. In early mathematics education research, mean scores are commonly used to evaluate learners' achievement before and after instructional interventions. For example, Cabigon and Dela Cruz (2020) utilized mean scores to assess students' performance improvements after the use of targeted instructional materials, demonstrating its effectiveness in summarizing learning outcomes.

Proficiency Level Metrics. This was used to classify learners' academic performance based on predefined performance descriptors. This approach allows for meaningful interpretation of learners' achievement levels beyond raw scores. According to Bloom et al. (1981), proficiency-based analysis helps educators identify mastery levels and learning gaps. In this study, proficiency levels were operationalized as Beginning (B), Developing (D), Approaching Proficiency (AP), Proficient (P), and Advanced (A), providing clear benchmarks for evaluating the effectiveness of the Strategic Intervention Worksheets (Villanueva & Bernardo, 2021).

Standard Deviation. Standard deviation was employed to determine the variability, homogeneity, or heterogeneity of learners' performance scores. Field (2018) emphasized that standard deviation is crucial in educational research because it indicates how scores are dispersed around the mean. A low standard deviation suggests homogeneous performance, while a high standard deviation reflects diverse learning outcomes. Studies evaluating instructional interventions, such as those by Alonzo et al. (2020), used standard deviation to analyze differences in learners' gains after implementing targeted instructional strategies.

Wilcoxon Signed-Rank Test. The Wilcoxon Signed-Rank Test was applied to determine whether there was a significant difference between learners' pretest and posttest scores after the use of the Strategic Intervention Worksheets. This non-parametric inferential statistical tool is appropriate when comparing two related sets of scores, particularly when the data do not meet the normality assumption required for parametric tests. Creswell and Guetterman (2019) highlighted that the Wilcoxon test is widely used in quasi-experimental and educational research to assess intervention effects in small samples or ordinal data. Recent studies, such as Mendoza and Aquino (2022), successfully employed the Wilcoxon Signed-Rank Test to confirm significant improvements in learners' mathematics performance following targeted instructional interventions. In this study, the Wilcoxon test provided evidence of statistically significant gains in all measured aspects of Mathematics 1.

Rank Biserial Correlation To determine the magnitude or practical significance of the intervention, Rank Biserial Correlation (R_{rb}) was used as the effect size measure. Unlike statistical significance, which only indicates whether a difference exists, R_{rb} quantifies the strength of the intervention effect. Kerby (2014) explained that Rank Biserial Correlation provides an intuitive

interpretation of effect sizes for paired comparisons, with values greater than ±0.5 considered large effects. Recent studies, including Navarro et al. (2021) and Santos et al. (2022), emphasized reporting R_{rb} to demonstrate practical improvements in learners' outcomes following scaffolded interventions. In this study, R_{rb} confirmed that the Strategic Intervention Worksheets had a large effect on learners' proficiency in simple 2-dimensional shapes, whole numbers up to 100, and addition within sums of 20, reinforcing the practical effectiveness of the intervention.

Modified ADDIE Model. The ADDIE instructional design model was used as the framework for developing and implementing the Strategic Intervention Worksheets. The ADDIE model comprising Analyze, Design, Develop, Implement, and Evaluate, was modified to address the specific needs of Grade 1 learners and the DepEd K–12 curriculum. The modified model emphasizes continuous evaluation and iterative refinement at every stage to ensure the worksheets are developmentally appropriate, engaging, and effective in improving learners' proficiency in Mathematics 1 (Branch, 2009; Molenda, 2015; Reiser & Dempsey, 2018).

RESULTS AND DISCUSSION

This section presents the results of the study on the effects of the Strategic Intervention Worksheets on the Mathematics performance of Grade 1 learners. The findings are discussed in relation to the study objectives and relevant educational theories to explain how the worksheets contributed to learners' understanding, mastery, and overall proficiency in simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20.

Status of Mathematics Proficiency of Grade 1 Learners

The results presented in Table 1 show the status of Mathematics proficiency of Grade 1 learners in terms of three key aspects: simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. The computed mean scores indicate that learners obtained 6.147 for shapes, 6.735 for whole numbers, and 6.618 for addition, with corresponding percentage levels of 61.471, 67.353, and 66.176, respectively. The overall average mean of 19.500 with a percentage level of 65.000 falls under the "Approaching Proficiency" level. All three areas were consistently interpreted as Approaching Proficiency (AP), indicating that learners have partial understanding but have not yet achieved mastery. The standard deviation values, ranging from 1.184 to 1.985, some differences in scores, indicating that learners' performance is relatively varied across the different competencies.

Table 1

Status of Mathematics Proficiency of Grade 1 Learners

Aspects	NI	Mean	SD	Int.	Int.	Rank
Simple 2- dimensional shape and their features	10	6.147	1.184	61.471	AP	3
Whole Numbers uo to 100	10	6.735	1.377	67.353	AP	1
Addition of Numbers with sums up to 20	10	6.618	1.985	66.176	AP	2

Over-all	30	19.500	1.516	65.000	AP

Note. NI = Number of Items; SD = Standard Deviation; PL = Percentage Level; Int. = Interpretation; D = Developing; AP = Approaching Proficiency. The following scale was used for interpretation: 0–24.9 = Beginning (B); 25.0–49.9 = Developing (D); 50.0–74.9 = Approaching Proficiency (AP); 75.0–100.0 = Proficient (P).

The data reveal that among the three areas, learners performed highest in whole numbers up to 100, followed by addition of numbers, and lowest in simple two-dimensional shapes and their features. This implies that learners are more familiar and comfortable with numerical concepts compared to spatial and geometric understanding. The relatively consistent results across the different competencies suggest that learners generally share a similar level of performance, although some variations in individual learning outcomes are still evident. Overall, the results indicate that learners demonstrate foundational knowledge but still require reinforcement and guided practice to achieve proficiency.

Based on these results, it can be inferred that Grade 1 learners possess emerging mathematical skills but still lack full conceptual understanding and procedural fluency. Their classification under the Approaching Proficiency level indicates that they are on the verge of mastery but require additional instructional support, scaffolding, and practice to progress to the Proficient level. The data suggest that learners can perform basic tasks with guidance but may struggle with more complex or unfamiliar problems independently. This highlights the need for targeted interventions that address specific weaknesses, particularly in geometry and problem-solving involving addition. It also implies that current teaching strategies should be enhanced to better support conceptual understanding and retention.

The findings of this study aligned with several recent studies emphasizing the importance of early numeracy development and intervention. Research by Nelson et al. (2024) and Turner et al. (2021) highlighted that early numeracy skills were strong predictors of later mathematical achievement and required structured instructional support. Similarly, Aunio et al. (2019) found that learners who received early intervention demonstrated significant improvement in basic number skills. Siegler (2016) emphasized that guided practice enhanced number sense and numerical understanding, while Gersten et al. (2017) reported that explicit instruction effectively improved early mathematics proficiency.

Fuchs et al. (2016) supported the use of structured intervention programs in addressing learning gaps among struggling learners. In addition, Powell et al. (2016) confirmed that targeted interventions improved mathematical reasoning skills, while Clarke et al. (2017) demonstrated that intervention programs significantly enhanced early numeracy outcomes. Duncan et al. (2017) further established that early math skills were strong predictors of long-term academic success. Clements and Sarama (2016) emphasized the importance of developmentally appropriate instruction, while Mullis et al. (2020) highlighted the role of instructional support in improving learners' mathematical performance. These studies collectively affirmed that learners at the Approaching Proficiency level benefited significantly from structured and targeted instructional interventions.

The results of the study were also supported by established learning theories, including Cognitive Development Theory, Constructivist Theory, and Zone of Proximal Development (ZPD). According to Cognitive Development Theory, Grade 1 learners were in the concrete operational stage, where logical

thinking developed through concrete experiences. The learners' performance at the Approaching Proficiency level suggested that they were transitioning toward logical reasoning but still required concrete representations to fully understand mathematical concepts. Constructivist Theory supported the idea that learners actively constructed knowledge through engagement, which aligned with the use of Strategic Intervention Worksheets that provided guided and hands-on learning experiences. Meanwhile, the Zone of Proximal Development emphasized the importance of scaffolding and guided instruction in bridging the gap between what learners could do independently and with assistance. The findings indicated that learners performed better with structured support, showing that the intervention effectively operated within their ZPD. Thus, the results reinforced the need for scaffolded and developmentally appropriate instruction to help learners progress toward full proficiency..

Development of Strategic Intervention Worksheets in Mathematics 1 Using the ADDIE Model

The ADDIE instructional design model is a systematic framework used to design, develop, implement, and evaluate instructional materials and learning interventions (Molenda, 2015). ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation, providing a structured and cyclical approach that ensures instructional interventions are learner-centered, developmentally appropriate, and evidence-based (Branch, 2009). In this study, the ADDIE model guided the development of Strategic Intervention Worksheets (SIWs) in Mathematics 1 for Grade 1 learners, focusing on simple 2-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20. The use of ADDIE ensured that each instructional phase was systematically aligned with learners' needs, curriculum standards, and assessment results.

Analyze Phase. During the Analyze phase, the researchers examined the baseline proficiency level of Grade 1 learners using a teacher-made pretest, as reflected in Table 2. The results revealed that learners were generally classified as Approaching Proficiency (AP) across all Mathematics 1 aspects, with percentage levels ranging from 61.471% to 67.353%. Although learners demonstrated basic understanding of shapes, numbers, and addition, the findings indicated noticeable gaps in conceptual understanding, consistency, and application skills. This analysis allowed the researchers to identify least mastered competencies, particularly in composing and decomposing shapes, number sequencing, and addition strategies. Consistent with instructional design theory, identifying learners' entry-level skills is essential in crafting effective and responsive interventions (Reiser & Dempsey, 2018).

Design Phase. In the Design phase, the researchers formulated clear learning objectives, instructional flow, and assessment strategies based on the results of the analysis. The Strategic Intervention Worksheets were carefully planned to include scaffolded activities, visual representations, guided practice, and age-appropriate tasks aligned with the MATATAG Curriculum and Grade 1 learning competencies. Each worksheet was designed to move learners from concrete to pictorial and semi-abstract representations, ensuring developmental appropriateness. Activities emphasized active engagement, repetition, and formative feedback to address the identified learning gaps. Research shows that well-designed instructional materials aligned with learner needs significantly enhance mastery and retention, especially in early mathematics (Branch, 2009; Khan, 2017).

Develop Phase. During the Develop phase, the planned Strategic Intervention Worksheets were produced based on the approved design. The worksheets incorporated simple instructions, colorful visuals, guided examples, and practice exercises tailored to the cognitive level of Grade 1 learners. Content accuracy, clarity, and alignment with objectives were ensured through expert validation by teachers and school

heads. Revisions were made based on feedback to enhance readability, engagement, and instructional clarity. This phase ensured that the worksheets were developmentally appropriate, learner-friendly, and ready for classroom implementation, which is a critical step in instructional material development (Molenda, 2015).

Implement Phase. The Implement phase involved the actual use of the Strategic Intervention Worksheets with the 34 Grade 1 learners who served as the respondents of the study. The worksheets were administered after the pretest, with the teacher facilitating the activities and providing guidance and feedback as needed. Learners engaged in hands-on tasks, visual problem-solving, and repeated practice to reinforce understanding of mathematical concepts. This phase allowed learners to actively construct knowledge through guided learning experiences. Effective implementation is vital because instructional materials yield positive outcomes only when delivered consistently with their intended design (Branch, 2009).

Evaluate Phase. The evaluate phase determined the effectiveness of the Strategic Intervention Worksheets using posttest results, nonparametric statistical analysis, and effect size measures. As shown in Table 3, learners' proficiency levels increased to percentage levels ranging from 87.059% to 90.588%, indicating substantial improvement after the intervention. The Wilcoxon Signed-Rank Test results in Table 4 revealed statistically significant differences ($p < .001$) between pretest and posttest scores across all aspects of Mathematics 1. Furthermore, rank biserial correlation values in Table 5 indicated large effect sizes, confirming the strong practical impact of the worksheets (Kerby, 2014). These findings validate the effectiveness of the intervention and support constructivist learning theory, which emphasizes scaffolding, active engagement, and learner-centered instruction (Bruner, 1966).

Overall, the systematic application of the ADDIE model ensured a strong connection between learner needs, instructional design, implementation, and measurable learning outcomes. The Analysis phase identified learning gaps, the Design and Development phases translated these gaps into targeted instructional materials, the Implementation phase provided structured learning experiences, and the Evaluation phase confirmed significant improvements in learners' mathematical proficiency. The results demonstrate that ADDIE-based Strategic Intervention Worksheets are effective in enhancing Grade 1 learners' Mathematics performance. This study reinforces existing research that structured, theory-driven instructional design models lead to meaningful and sustained learning gains, particularly in early grade mathematics (Khan, 2017; Reiser & Dempsey, 2018).

Level of Mathematics Proficiency of Grade 1 Learners After the Use of Strategic Intervention Worksheets

This section presents the learners' proficiency in key areas of Mathematics 1 after the use of the Strategic Intervention Worksheets. The table highlights learners' performance in simple 2-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20.

The data in Table 2 present the level of Mathematics proficiency of Grade 1 learners across three key competencies: simple two-dimensional shapes, whole numbers up to 100, and addition of numbers with sums up to 20. The results show that learners obtained mean scores of 8.706 for shapes, 9.029 for whole numbers, and 9.059 for addition, with corresponding percentage levels of 87.059, 90.294, and 90.588, respectively. The overall mean score of 26.794, with a percentage level of 89.314, indicates that the learners are at the Approaching Proficiency level. All areas consistently fall within the same interpretation,

suggesting that learners demonstrate a relatively high level of understanding across all assessed competencies. This indicates that learners are nearing mastery but still have room for improvement to reach the Proficient level.

A closer examination of the results reveals that learners performed best in addition of numbers with sums up to 20, followed closely by whole numbers, while simple two-dimensional shapes recorded the lowest mean score. This suggests that learners are more confident and skilled in numerical operations than in geometric concepts. The minimal differences in the mean scores across the three domains indicate that learners' performance is relatively consistent. However, the slight variation still highlights areas that require further reinforcement, particularly in spatial and visual understanding. Overall, the results demonstrate that learners have strong foundational mathematical skills but still require continued support to achieve full mastery.

Table 2

Level of Mathematics Proficiency of Grade 1 Learners after the Use of SIW

Aspects	NI	Mean	SD	Int.	Int.	Rank
Simple 2- dimensional shape	10	8.706	1.867	87.059	AP	3
Whole Numbers uo to 100	10	9.029	1.243	90.294	AP	2
Addition of Numbers with sums up to 20	10	9.059	1.013	90.588	AP	1
Average	30	26.794	1.374	89.314	AP	

Note. NI = Number of Items; SD = Standard Deviation; PL = Percentage Level; Int. = Interpretation; D = Developing; AP = Approaching Proficiency. The following scale was used for interpretation: 0–24.9 = Beginning (B); 25.0–49.9 = Developing (D); 50.0–74.9 = Approaching Proficiency (AP); 75.0–100.0 = Proficient (P)

From these findings, it can be inferred that Grade 1 learners possess a solid grasp of basic mathematical concepts but have not yet reached full proficiency. Their classification under the Approaching Proficiency level indicates that they are capable of performing mathematical tasks with some degree of accuracy but still need guidance for more complex or unfamiliar tasks. The results imply that learners are transitioning toward higher levels of understanding, yet gaps in conceptual and procedural knowledge remain. This calls for instructional strategies that emphasize reinforcement, repetition, and meaningful learning experiences. Targeted interventions and continuous practice are therefore necessary to bridge the gap between approaching proficiency and full mastery.

These results are supported by several recent studies emphasizing the importance of early mathematics development and structured intervention. Recent research by Fuchs et al. (2019) highlights that structured early math interventions significantly improve number sense and arithmetic skills among young learners. Similarly, Gersten et al. (2018) emphasized the effectiveness of explicit instruction in enhancing early mathematical proficiency. Powell et al. (2017) found that targeted intervention programs improve mathematical reasoning and problem-solving skills in early grades. Clements et al. (2018) demonstrated that developmentally appropriate and engaging instructional practices significantly improve early

numeracy outcomes. Jordan et al. (2017) confirmed that early numeracy skills are strong predictors of later achievement and benefit from intervention. Clarke et al. (2017) showed that structured intervention programs significantly improve mathematical performance among elementary learners. Geary et al. (2017) found that cognitive development and working memory play a key role in mathematics learning. Purpura et al. (2017) emphasized that early number knowledge is strongly associated with later mathematics success. Siegler and Ramani (2018) demonstrated that guided learning activities significantly enhance numerical understanding. Ramani et al. (2018) further supported the effectiveness of game-based and structured interventions in improving math skills. Lee et al. (2019) emphasized that early intervention reduces learning gaps in mathematics. Van Luit et al. (2019) found that early numeracy interventions improve foundational math competencies. NCTM (2018) supports instructional practices that emphasize conceptual understanding and problem-solving. Mulligan et al. (2020) highlighted that spatial reasoning contributes to mathematical development. Riccomini et al. (2017) emphasized explicit and systematic instruction as essential for early learners. These studies collectively confirm that learners at the Approaching Proficiency level benefit significantly from structured, guided, and research-based instructional interventions.

Furthermore, additional recent studies reinforce the effectiveness of guided and structured learning in mathematics. Frye et al. (2019) emphasized the importance of early math interventions in building foundational skills. Jordan and Levine (2017) found that early intervention improves both procedural and conceptual knowledge in mathematics. Mazzocco et al. (2018) demonstrated that targeted support enhances number sense development. Sarnecka and Carey (2017) showed that early number understanding predicts later math achievement. Mix et al. (2018) highlighted the importance of spatial and cognitive development in math learning. These studies further support the conclusion that structured, consistent, and engaging instructional approaches are crucial in improving learners' proficiency in mathematics.

The findings of the study are also grounded in key learning theories such as Piaget's Cognitive Development Theory, Bruner's Constructivist Theory, and Vygotsky's Zone of Proximal Development (ZPD). Piaget's theory suggests that learners in the concrete operational stage develop logical thinking through concrete and hands-on experiences, which aligns with the learners' ability to perform at the Approaching Proficiency level. Bruner's Constructivist Theory emphasizes that learners construct knowledge through active engagement, which is reflected in their improved performance through guided tasks and structured worksheets. Vygotsky's ZPD highlights the importance of scaffolding and guided instruction in bridging the gap between what learners can do independently and with assistance. The results indicate that learners improved when provided with appropriate support, demonstrating that the intervention effectively operated within their ZPD. Thus, the findings affirm that scaffolded, learner-centered, and developmentally appropriate instruction is essential in advancing learners toward full mathematical proficiency.

Significant Difference Between the Mathematics Proficiency of Grade 1 Learners Before and After The Use of Strategic Intervention Worksheets

The results presented in Table 3 indicate the significant difference in learners' proficiency in Mathematics before and after the implementation of Strategic Intervention Worksheets. Based on the Wilcoxon Signed-Rank Test, all three aspects—simple two-dimensional shapes and their features, whole numbers up to 100,

and addition of numbers with sums up to 20 produced p-values of less than 0.001. This clearly signifies that the differences between the pretest and posttest scores are statistically significant across all domains. Additionally, the Wilcoxon W values further confirm that notable improvements occurred in learners' performance after the intervention. Taken together, these results demonstrate that the Strategic Intervention Worksheets had a significant and positive impact on learners' mathematics proficiency.

Table 3

Significant Difference Between the Mathematics Proficiency of Grade 1 Learners Before and After the Use of Strategic Intervention Worksheets

Aspects	Wilcoxon W	p-value	Interpretation
Simple 2- dimensional shape and their features	31.01	<.001	S
Whole Numbers up to 100	19.5	<.001	S
Addition of Numbers with sums up to 20	0.00	<.001	S

Note. p-value interpretation: $p > 0.05$ = Not Significant (NS), $p < 0.05$ = Significant (S).

Looking more closely at the findings, it can be observed that the most substantial improvement was recorded in the addition of numbers with sums up to 20, as reflected by the lowest Wilcoxon W value. This suggests that learners gained the greatest benefit in this particular skill after the intervention. Similarly, meaningful improvements were also noted in whole numbers and simple two-dimensional shapes, as shown by their corresponding test statistics and significant p-values. In addition, the consistent significance across all areas indicates that the intervention effectively addressed multiple domains of mathematical learning. Overall, the results suggest that learners developed both conceptual understanding and procedural fluency through the use of structured intervention.

From these outcomes, it can be inferred that the Strategic Intervention Worksheets played a vital role in enhancing learners' mathematical proficiency. Specifically, the significant differences between pretest and posttest scores imply that learners were able to improve their performance through guided and structured learning experiences. Moreover, the results indicate that learners progressed from limited understanding toward greater mastery of mathematical concepts. This also suggests that the intervention provided the necessary support to bridge learning gaps that were not fully addressed through regular instruction alone. Consequently, the findings highlight the importance of providing targeted instructional support to strengthen learners' academic performance.

Furthermore, the findings are supported by several recent studies that emphasize the effectiveness of structured intervention in improving early mathematics achievement. For instance, Fuchs et al. (2019) found that targeted interventions significantly enhance number sense and arithmetic skills. Likewise, Gersten et al. (2018) reported that explicit and systematic instruction leads to notable improvements in mathematics performance. In the same way, Powell et al. (2017) demonstrated that structured intervention programs improve problem-solving and conceptual understanding. Additionally, Clements et al. (2018) emphasized that developmentally appropriate instructional strategies significantly improve early numeracy outcomes. Similarly, Jordan et al. (2017) confirmed that early intervention produces significant gains in foundational math skills. In parallel, Clarke et al. (2017) revealed that intervention-based instruction results in statistically significant improvements in learner performance. Riccomini et al. (2017) also supported the effectiveness of explicit instruction in mathematics.

Moreover, Lee et al. (2019) and Van Luit et al. (2019) both found that early numeracy interventions enhance mathematical proficiency. At the same time, Geary et al. (2017) linked cognitive processes to improved mathematics achievement, while Siegler and Ramani (2018) demonstrated that guided practice strengthens number understanding. In addition, Ramani et al. (2018) highlighted the benefits of structured learning activities, and Mazzocco et al. (2018) emphasized targeted support in improving numerical skills. Likewise, Frye et al. (2019) confirmed that early interventions result in measurable learning gains. Lastly, Mulligan et al. (2020) stressed the importance of spatial reasoning and structured instruction in mathematics development. Collectively, these studies reinforce the conclusion that structured intervention strategies, such as Strategic Intervention Worksheets, are effective in significantly improving learners' mathematics proficiency.

Finally, the results can be interpreted through established learning theories, including Piaget's Cognitive Development Theory, Bruner's Constructivist Theory, and Vygotsky's Zone of Proximal Development (ZPD). According to Piaget, learners at the concrete operational stage develop logical thinking through concrete and hands-on experiences, which aligns with the observed improvements after the intervention. In the same vein, Bruner's Constructivist Theory emphasizes that learners actively construct knowledge through meaningful engagement, which is reflected in the learners' progress. Furthermore, Vygotsky's ZPD highlights the importance of scaffolding and guided instruction in helping learners achieve higher levels of understanding. The significant improvement from pretest to posttest suggests that the intervention effectively provided support within the learners' ZPD. Therefore, the findings confirm that structured, scaffolded, and learner-centered instruction plays a crucial role in enhancing mathematics proficiency among early learners.

Effectiveness of Strategic Intervention Worksheets in Enhancing the Mathematics Proficiency of Grade 1 Learners

This section presents the effectiveness of the Strategic Intervention Worksheets (SIWs) in enhancing Grade 1 learners' proficiency in Mathematics, as measured by the Rank Biserial correlation (r_rb).

The data presented in Table 4 highlight the effectiveness of the Strategic Intervention Worksheets in enhancing the proficiency of Grade 1 learners in Mathematics. Based on the computed Rank Biserial Correlation (r_rb), all aspects—simple two-dimensional shapes and their features, whole numbers up to 100, and addition of numbers with sums up to 20—obtained values interpreted as having a large effect. Specifically, the values range from -0.883 to -1.000, all of which fall within the threshold for a large effect size. This indicates that the intervention had a strong and meaningful impact on learners' mathematics proficiency. Overall, the findings demonstrate that the instructional materials used in the study were highly effective in improving learners' performance.

Examining the results more closely, it can be noted that the aspect on addition of numbers with sums up to 20 yielded the highest effect size, reaching a perfect value of -1.000. This suggests a very strong impact of the intervention on learners' computational skills in basic addition. Similarly, the aspects on whole numbers up to 100 and simple two-dimensional shapes also showed very high effect sizes, indicating substantial improvements in both numerical understanding and geometric knowledge. Furthermore, the consistency of large effect sizes across all domains implies that the intervention was not limited to a single area but was effective across multiple mathematical competencies. In addition, these results suggest that learners were able to internalize and apply the concepts more effectively after exposure to the intervention.

Table 4

Effectiveness of Strategic Intervention Worksheets in Enhancing the Proficiency in Mathematics of Grade 1 Learners

Aspects	Rank Biserial R	Interpretation
Simple 2- dimensional shape and their features	-0.883	Large effect
Whole Numbers up to 100	-0.934	Large effect
Addition of Numbers with sums up to 20	-1	Large effect

Note. Interpretation of rank biserial correlation (r_rb) effect size: r_rb ≈ 0 = negligible effect; r_rb ±0.1–0.3 = small effect; r_rb ±0.3–0.5 = medium effect; r_rb > ±0.5 = large effect (Kerby, 2014).

From these findings, it can be inferred that the Strategic Intervention Worksheets were highly successful in producing meaningful learning gains. In particular, the large effect sizes indicate that the intervention did not only result in statistically significant improvements but also in practically significant changes in learners' proficiency. Moreover, the results imply that the learners were able to engage more deeply with the learning materials, leading to stronger conceptual understanding and skill development. Likewise, the structured and guided nature of the worksheets likely contributed to these substantial gains. Therefore, the intervention can be considered an effective instructional tool in addressing learning gaps and enhancing student performance.

Additionally, these findings are strongly supported by recent studies that emphasize the effectiveness of structured instructional interventions in mathematics. For instance, Fuchs et al. (2019) found that targeted interventions produce large and meaningful improvements in students' numerical skills. Similarly, Gersten et al. (2018) reported that explicit and systematic instruction leads to significant learning gains. In the same way, Powell et al. (2017) demonstrated that structured intervention programs result in strong improvements in problem-solving abilities. Furthermore, Clements et al. (2018) emphasized that developmentally appropriate and engaging instructional materials enhance early numeracy skills. Correspondingly, Jordan et al. (2017) confirmed that early intervention significantly improves foundational mathematics performance. In addition, Clarke et al. (2017) highlighted the effectiveness of intervention-based strategies in improving learning outcomes. Riccomini et al. (2017) also supported the use of explicit instruction in mathematics. Moreover, Lee et al. (2019) and Van Luit et al. (2019) both found strong evidence that early numeracy interventions yield substantial improvements. In parallel, Geary et al. (2017) linked cognitive development to mathematical achievement, while Siegler and Ramani (2018) showed that guided practice enhances number sense. Likewise, Ramani et al. (2018) and Mazzocco et al. (2018) emphasized the importance of structured and targeted support in improving mathematical

skills. Additionally, Frye et al. (2019) and Mulligan et al. (2020) confirmed that early and structured interventions lead to significant learning gains. Collectively, these studies validate the finding that the Strategic Intervention Worksheets are highly effective in improving learners' mathematics proficiency.
Finally, the effectiveness of the intervention can be interpreted through established learning theories such as Piaget's Cognitive Development Theory, Bruner's Constructivist Theory, and Vygotsky's Zone of Proximal Development (ZPD). According to Piaget, learners develop cognitive skills through active interaction with their environment, which is supported by the hands-on nature of the worksheets. Likewise, Bruner's Constructivist Theory emphasizes that learners construct knowledge through meaningful engagement, which is evident in the learners' improved performance. Moreover, Vygotsky's ZPD highlights the importance of scaffolding and guided learning, suggesting that the intervention provided the necessary support for learners to achieve higher levels of understanding. The large effect sizes observed in the study further indicate that the intervention effectively bridged the gap between learners' current abilities and potential development. Thus, the findings affirm that structured, scaffolded, and learner-centered instructional strategies are essential in promoting significant improvements in mathematics learning.

CONCLUSIONS

1. Grade 1 learners initially demonstrated an Approaching Proficiency level in all assessed areas of Mathematics, including Simple 2 Dimensional Shapes, Whole Numbers up to 100, and Addition of Numbers with sums up to 20.
2. The Strategic Intervention Worksheets were systematically developed using the ADDIE Model, ensuring that each phase including Analysis, Design, Development, Implementation, and Evaluation addressed the specific learning needs of the learners. The materials were structured to provide clear instructions, scaffolded exercises, and visual aids that promote active engagement and conceptual understanding.
3. After the implementation of the SIWs, learners showed significant improvement in all aspects, achieving Proficient (P) levels in the posttest assessment.
4. There is a significant difference between the proficiency of learners before and after the use of SIW's .
5. Effect sizes, measured using Rank Biserial R, indicated a large effect in all areas, with the greatest impact observed in addition skills. The intervention successfully addressed foundational gaps and promoted sustained improvement in early mathematics.

RECOMMENDATIONS

1. Teachers in Grade 1 and other early grade levels should regularly use strategically designed worksheets, similar to the SIWs, to reinforce foundational mathematics skills. These worksheets should include scaffolded exercises, visual aids, and step-by-step guided activities to support learners in mastering key concepts such as shapes, whole numbers, and basic operations.
2. School administrators and educators are encouraged to adopt the ADDIE Model when designing instructional materials. Systematic planning covering Analysis, Design, Development, Implementation, and Evaluation which ensures that lessons address learners' needs, provide structured support, and are assessed for effectiveness.

3. DepEd should conduct training sessions and workshops for teachers on using scaffolded, research-based interventions and understanding learning theories such as Piaget's Cognitive Development Theory, Vygotsky's ZPD, and Bruner's Constructivist Theory. This equips educators to identify learners' readiness levels and provide appropriate support within their Zone of Proximal Development.

4. Teachers should implement regular formative assessments to track learners' proficiency and identify areas that need additional reinforcement. This allows targeted interventions before misconceptions become entrenched, ensuring sustained improvement in foundational mathematics skills.
5. Learning activities should actively involve learners in manipulating numbers, shapes, and problem-solving tasks, rather than relying solely on rote memorization. Using concrete and visual materials fosters deep understanding, builds confidence, and prepares learners for more complex mathematical operations.
6. DepEd may consider incorporating structured intervention worksheets and guided exercises as part of the official Grade 1 mathematics curriculum. By embedding evidence-based instructional tools into regular teaching, schools can systematically improve learners' numeracy skills and reduce learning gaps early.
7. Teachers should share best practices and collaboratively develop intervention materials based on classroom data. Peer collaboration can improve instructional strategies, promote consistency in scaffolded support, and ensure that all learners benefit from targeted interventions.

REFERENCES

1. Adams, G., & Engelmann, S. (1996). *Research on direct instruction: 25 years beyond DISTAR*. Educational Achievement Systems.
2. Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C., & Norman, M. K. (2019). *How learning works: Seven research-based principles for smart teaching* (2nd ed.). Jossey-Bass.
3. Ambrose, S. A., et al. (2019). Constructivist learning theory and instructional design. (Full source details not provided in manuscript).
4. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
5. Ary, D., Jacobs, L. C., & Sorensen, C. K. (2010). *Introduction to research in education* (8th ed.). Wadsworth.
6. Aunio, P., et al. (2019). Early numeracy intervention outcomes. (Publication details not fully provided in manuscript).
7. Aunio, P., Heiskari, N., Van Luit, J. E. H., & Vuorio, J. (2023). Early mathematics development and cognitive foundations: A review. *Early Childhood Research Quarterly, 64*, 1–12.
8. Aunio, P., et al. (2023). Early mathematics learning and cognitive development. (Publication details not fully provided in manuscript).
9. Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
10. Baroody, A. J. (2013). Fostering early numeracy in preschool and kindergarten. *Encyclopedia of Early Childhood Development*, 1–6.
11. Baroody, A. J., & Dowker, A. (Eds.). (2003). *The development of arithmetic concepts and skills*. Lawrence Erlbaum Associates.

12. Bautista, R. (2022). Effects of structured intervention materials on learners' mathematics performance. (Publication details not fully provided in manuscript).
13. Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university* (4th ed.). McGraw-Hill.
14. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education, 5*(1), 7–74.
15. Bloom, B. S., Madaus, G. F., & Hastings, J. T. (1981). *Evaluation to improve learning*. McGraw-Hill.
16. Borich, G. D. (2016). *Effective teaching methods: Research-based practice* (9th ed.). Pearson.
17. Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer.
18. Bruner, J. S. (1966). *Toward a theory of instruction*. Harvard University Press.
19. Butler, F. M., Muth, K. D., & Sherry, L. (2013). Mathematical intervention strategies for struggling learners. *Journal of Educational Psychology, 105*(2), 345–359.
20. Cabigon, J. V., & Dela Cruz, R. T. (2020). Instructional materials and learners' mathematics performance. *Philippine Journal of Education, 15*(2), 45–58.
21. Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (2014). *Children's mathematics: Cognitively guided instruction* (2nd ed.). Heinemann.
22. Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (2nd ed.). Routledge.
23. Clarke, B., et al. (2017). Early mathematics intervention effectiveness. (Publication details not provided in manuscript).
24. Cobb, P., & Yackel, E. (1996). Constructivist perspectives on mathematics learning. *Educational Psychologist, 31*(3–4), 175–190.
25. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.
26. Common Core State Standards Initiative. (2010). *Common Core State Standards for Mathematics*. http://www.corestandards.org
27. Creswell, J. W., & Guetterman, T. C. (2019). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson.
28. Crocker, L., & Algina, J. (2006). *Introduction to classical and modern test theory*. Wadsworth.
29. Daro, P., Mosher, F., & Corcoran, T. (2011). *Learning trajectories in mathematics: A foundation for standards*. CPRE.
30. Darling-Hammond, L. (2017). *Empowered educators*. Jossey-Bass.
31. DepEd. (2016). *K to 12 Mathematics Curriculum Guide*. Department of Education, Philippines.
32. DepEd Order No. 8, s. 2015. Policy guidelines on classroom assessment for the K to 12 basic education program.
33. DepEd Order No. 29, s. 2017. Policy guidelines on system assessment in the K to 12 basic education program.
34. DepEd Order No. 31, s. 2012. Policy guidelines on the implementation of grades 1 to 10 curriculum.
35. Dewey, J. (1938). *Experience and education*. Macmillan.
36. Dowker, A. (2019). Early intervention in mathematics learning. (Publication details not fully provided).
37. Duncan, G. J., et al. (2017). Early math skills and later achievement. *Developmental Psychology, 53*(7), 123–134.

38. Ebel, R. L., & Frisbie, D. A. (1991). *Essentials of educational measurement* (5th ed.). Prentice Hall.
39. Engelmann, S. (2007). *Theory of instruction: Principles and applications*. ADI Press.
40. Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). Sage.
41. Flavell, J. H. (1963). *The developmental psychology of Jean Piaget*. Van Nostrand.
42. Fuchs, L. S., et al. (2016). Intervention effects in early mathematics. *Journal of Learning Disabilities, 49*(3), 263–276.
43. Gardner, H. (2011). *Frames of mind: The theory of multiple intelligences*. Basic Books.
44. Garcia, R. (2021). Localized instruction and learner performance in mathematics. (Publication details not fully provided).
45. Geary, D. C., et al. (2017). Cognitive processes in mathematics learning. (Publication details not provided).
46. Ginsburg, H. P. (2009). *The challenge of formative assessment in mathematics education*. Teachers College Press.
47. Gravetter, F. J., Wallnau, L. B., Forzano, L. A. B., & Witnauer, J. E. (2021). *Essentials of statistics for the behavioral sciences* (10th ed.). Cengage.
48. Hattie, J. (2009). *Visible learning*. Routledge.
49. Hiebert, J. (Ed.). (2003). *Teaching mathematics in grades 2–3*. Teachers College Press.
50. Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching. In F. Lester (Ed.), *Second handbook of research on mathematics teaching and learning*.
51. Jordan, N. C., & Levine, S. C. (2017). Early mathematics development. (Publication details not provided).
52. Karp, K. S., Bush, S. B., & Dougherty, B. J. (2014). 13 rules that expire: A decade of research on algebra misconceptions. *The Mathematics Teacher, 108*(2), 126–132.
53. Kerby, D. S. (2014). The simple difference formula for effect size. *Journal of Applied Psychology, 99*(3), 589–595.
54. Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding it up: Helping children learn mathematics*. National Academies Press.
55. Kolb, D. A. (1984). *Experiential learning*. Prentice Hall.
56. Kozulin, A., et al. (2020). Vygotsky's educational theory in cultural context. Cambridge University Press.
57. Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
58. Levine, S. C., Jordan, N. C., & Huttenlocher, J. (2011). Development of number comparison. *Cognitive Psychology, 62*(1), 1–29.
59. Lynn, S. K., & Riedel, M. (2015). Effective instructional interventions in elementary mathematics. *Journal of Intervention Studies, 22*(4), 201–218.
60. Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press.
61. Mazzocco, M. M. M., & Devlin, K. T. (2008). Math anxiety, working memory, and intervention. *Developmental Neuropsychology, 33*(1), 127–145.
62. McMillan, J. H. (2018). *Classroom assessment: Principles and practice* (7th ed.). Pearson.
63. Mendoza, R. (2020). Intervention-based learning in mathematics. (Publication details not provided).

64. Mix, K. S., et al. (2018). Spatial reasoning in mathematics learning. (Publication details not provided).
65. Molenda, M. (2015). In search of the elusive ADDIE model. *Performance Improvement, 54*(2), 40–42.
66. Mulligan, J., et al. (2020). Spatial reasoning and mathematics achievement. (Publication details not provided).
67. Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2020). *TIMSS 2019 international results in mathematics*. IEA.
68. National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. NCTM.
69. Navarro, J., et al. (2021). Effect size in educational interventions. *Educational Measurement Journal, 38*(2), 55–67.
70. Nelson, G., et al. (2024). Early numeracy assessment in first-grade learners. *Journal of Early Childhood Education Research, 12*(1), 1–18.
71. OECD. (2019). *PISA 2018 results (Volume I): What students know and can do*. OECD Publishing.
72. OpenStax. (2024). *Psychology 2e: Piaget's theory of cognitive development*. Rice University.
73. Ormrod, J. E. (2020). *Educational psychology: Developing learners* (10th ed.). Pearson.
74. Outhwaite, L. A., Gulliford, A., & Pitchford, N. J. (2017). Closing the gap in early mathematics intervention. *Journal of Educational Psychology, 109*(1), 1–17.
75. Pashler, H., et al. (2007). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest, 9*(3), 105–119.
76. Pellegrino, J. W., Chudowsky, N., & Glaser, R. (2001). *Knowing what students know*. National Academies Press.
77. Polya, G. (1957). *How to solve it* (2nd ed.). Princeton University Press.
78. Reiser, R. A., & Dempsey, J. V. (2018). *Trends and issues in instructional design and technology* (4th ed.). Pearson.
79. Sarnecka, B. W. (2015). Number concepts in early childhood. *Child Development Perspectives, 9*(3), 183–189.
80. Santos, R., et al. (2022). Scaffolding and mathematics achievement. *Asian Journal of Education and Training, 8*(3), 112–120.
81. Schneider, M., et al. (2017). Early math intervention outcomes. (Publication details not provided).
82. Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th ed.). Pearson.
83. Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.
84. Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1–22.
85. Shiwaku, K., & Shaw, R. (2018). School-based resilience and learning interventions. (Publication details not provided).
86. Siegler, R. S. (2016). *Continuity and change in early numerical development*. Academic Press.
87. Slavin, R. E. (2018). *Educational psychology: Theory and practice* (12th ed.). Pearson.
88. Sweller, J. (1988). Cognitive load during problem solving. *Cognitive Science, 12*(2), 257–285.

89. Torgesen, J. K. (2000). Individual differences in response to early interventions. *Learning Disabilities Research & Practice, 15*(2), 55–64.
90. Tomlinson, C. A. (2017). *How to differentiate instruction in academically diverse classrooms* (3rd ed.). ASCD.
91. Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2019). *Elementary and middle school mathematics: Teaching developmentally* (10th ed.). Pearson.
92. Van Luit, J. E. H., & Schopman, E. A. M. (2000). Improving early numeracy instruction. *Educational Studies in Mathematics, 43*(1), 1–18.
93. Vygotsky, L. S. (1978). *Mind in society*. Harvard University Press.
94. Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). ASCD.
95. World Bank. (n.d.). Sustainable Development Goal 4: Quality education. https://www.un.org/sustainabledevelopment/education/