

Teaching strategies and mathematics performance of intermediate pupils in multigrade classes within the SAMARICA District

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Abstract

This study investigated the Teaching Strategies and Mathematics Performance of Intermediate Pupils in Multigrade in the Samarica District, Occidental Mindoro. This study used an exploratory sequential mixed-methods design. In the qualitative phase, the findings highlighted three emerging major themes: active learning strategies, differentiated instruction, and assessment and feedback mechanisms. The quantitative data were collected from 225 elementary pupils in a multigrade in the SAMARICA District, Occidental Mindoro, and then they underwent statistical analyses. To test the instrument's reliability, the split-half technique was used, and the reliability coefficient was determined using Cronbach's alpha. This research employed two primary instruments as part of the mixed-methods strategy: an interview for the qualitative component and a standardized Mathematics test, the Rapid Mathematics Assessment tool, for the quantitative component. Weighted means were computed to describe the mean extent of each indicator of the Teaching Strategies and Mathematics Performance of Intermediate Pupils in Multigrade in the SAMARICA District, Occidental Mindoro. The results show a uniform, high composite mean across all dimensions, suggesting that teachers exhibit high levels of pedagogical engagement and organized instructional practices in multigrade classrooms. However, the study results show a significant gap between the implementation of multiple teaching strategies and pupils' performance, indicating the need for focused teaching and support in the SAMARICA District. Consequently, this study recommended that teachers optimize instructional time in multigrade settings through structured rotational teaching models. School administrators may provide continuous professional development training specifically tailored for multigrade teachers.

Keywords: teaching strategies, mathematics performance, multigrade classes, rapid mathematics assessment tool, mixed method approach

Teaching strategies and mathematics performance of intermediate pupils in multigrade classes within the SAMARICA District

1. Introduction

The Multigrade Program in the Philippine Education system is a Department of Education strategy to expand access to basic education, particularly in geographically isolated and disadvantaged areas. Its implementation is reinforced through policies that focus on enhancing teacher competence, providing adequate learning resources, and ensuring institutional support systems (Department of Education, 2009). Across studies, the effectiveness of teaching is consistently linked not to classroom format but to the teacher's ability to design, organize, and implement instruction that is clear, engaging, and responsive to learners' needs (Simonson, 2022). Even so, educational experts claim that multigrade systems create more challenges than opportunities. However, more researchers are coming to a different conclusion. Morphett (2025) argues that students in multigrade settings in remote areas perform similarly to their peers in single-grade settings on math. Proper teaching plans and classroom management help lower the disadvantages of multigrade teaching on learners.

The recent study conducted by Numajiri (2025) in primary schools located in Sindh, Pakistan, showed that multigrade teaching influences students' performance in mathematics in relation to other factors, including gender and the school's geographical location. The study also pointed out that the challenge of teaching multiple curricula simultaneously creates barriers to genuine learning in mathematics, even when supported by sound policies and training. This aligns with the concerns of teachers in rural Philippine schools who attempt to balance teaching multiple grade levels and subjects within limited time and resources. Along the same lines, Morphett (2025) has studied the teaching and learning components of rural multigrade inclusive classrooms and reported that a sustained multigrade teaching and learning process in such settings depends largely on the teacher's creativity and resourcefulness. In particular, the study emphasized the need for responsive frameworks, including tailored multi-grade teaching, multi-level group teaching, and pupil teaching, which are only made possible with the support of the educational structure and sustained foresight. The results highlight the need to actively assess the methods and techniques employed in multigrade teaching across geographical settings, such as rural schools in San Jose, Magsaysay, Rizal, and Calintaan, which are characterized by multigrade classes.

In the local context of the Philippines, Jose et al. (2025) conducted a descriptive correlational study examining the grades 3 and 4 pupils in multigrade schools in the Misamis Occidental region. It was found that pupils reported very high satisfaction with the learning process, but the teaching strategies used did not always lead to an improvement in pupils' academic performance. This indicates that pupils' engagement in the learning process does not guarantee they will achieve the required skill mastery. In this case, mathematical competencies highlight the need to evaluate the influence of teaching strategies on learning outcomes. In the SAMARICA Districts (San Jose, Magsaysay, Rizal, and Calintaan) in Occidental Mindoro, multigrade classes offer an interesting lens for exploring the interplay between teaching and learning in mathematics across pupils' diverse contexts.

Taken together, these studies show a gap in understanding the effectiveness of multigrade teaching in mathematics. While the literature has much to say about the advantages and disadvantages of teaching in multigrade classes, there is a gap in understanding of how such a structure affects teaching and learning performance, warranting a more focused and thorough study. This is why this research aims to identify and analyze the teaching strategies employed in multigrade classes in the Districts of San Jose, Magsaysay, Rizal, and Calintaan, and to evaluate their effectiveness with regard to pupils' performance in mathematics. The objective of this research is to develop an intervention program to improve mathematics teaching and learning in this classroom environment.

Statement of the Problem - This research aimed to explore the teaching strategies employed in multigrade classes and how these strategies affect the mathematics performance of intermediate pupils in the SAMARICA District. Specifically, the study sought to answer the following questions: (1) What are the teaching strategies employed in multigrade classes in SAMARICA Elementary Schools? (2) What is the extent of teaching strategies employed in multigrade classes in terms of active learning strategies, differentiated instruction, and assessment and feedback mechanisms? (3) What is the level of mathematics performance of the intermediate pupils in multigrade classes? (4) Is there a significant relationship between the teaching strategies and the mathematics performance of intermediate pupils in multigrade classes? (5) What intervention program may be proposed to improve the teaching strategies and the mathematics performance of intermediate pupils in multigrade classes?

Significance of the Study - This study is significant as it addresses a critical issue in the delivery of mathematics instruction within the diverse classroom settings of the SAMARICA District—specifically the multigrade classes. By identifying and analyzing the teaching strategies employed in this setup and their influence on pupils' academic performance, the research will provide valuable insights into instructional effectiveness in rural educational contexts. For intermediate pupils, this will help identify which teaching strategies pupils will experience that make them more motivated, confident, and interested in learning. For multigrade teachers, the study can serve as a reflective tool for evaluating and strengthening their pedagogical approaches. It may also provide evidence-based strategies that can be adapted to optimize student engagement and mastery in Mathematics across different classroom structures. For parents and the community, this will help them understand how their children learn and how to reinforce different teaching styles at home.

For school administrators, the findings can inform decisions about teacher deployment, curriculum adaptation, and resource allocation in geographically isolated or low-enrollment schools. For Department of Education Policymakers, the study may guide the Department of Education in enhancing support mechanisms for teachers who handle multigrade classes and in designing context-sensitive interventions to improve learning outcomes. Also, for the Department of Education, School Division of Occidental Mindoro, the findings can guide the Department in designing training programs focused on effective teaching strategies suited to multigrade classroom settings. Additionally, it may serve as a basis for revising or strengthening existing policies and curriculum frameworks to ensure they are responsive to the needs of multigrade pupils. For the Local Government Units (LGUs) of the Samarica District, the study's results may serve as a guide for local officials to allocate resources, support teacher training, and implement educational interventions to address the learning needs of pupils in public elementary multigrade schools. For Curriculum Developers and Education Planners, this research provides empirical evidence on how differentiated teaching strategies affect mathematics achievement, informing the development of inclusive and adaptive instructional frameworks, particularly for intermediate learners. Lastly, for future researchers, the study will serve as a valuable reference for understanding the dynamics of classroom structure, teaching strategy, and student performance in the context of rural basic education. It may also open avenues for further investigations into subject-specific outcomes in multigrade teaching environments.

Scope and Delimitation of the Study - This study covered the mathematics performance of pupils in Grades 4 to 6 during the school year 2025-2026 in relation to the teaching strategies employed in multigrade classes. It is carried out in public elementary schools with multigrade classes in the SAMARICA District, specifically in the Municipalities of San Jose, Magsaysay, Rizal, and Calintaan in Occidental Mindoro. The research focuses solely on mathematics and excludes other subjects. Active learning strategies, differentiated instruction, and Assessment and Feedback Mechanisms are the teaching strategies under study as the major variable. The study's respondents in the qualitative phase were 20 teachers of multigrade classes, while in the quantitative phase, 225 intermediate pupils in multigrade classes were included. The interview guide was used for the qualitative phase, and a survey questionnaire and the DepEd Rapid Mathematics Assessment tool for the quantitative phase.

2. Methodology

Research Design - This study utilized a mixed sequential exploratory design. As noted by Creswell (2014), the sequential exploratory design included qualitative data collection and analysis, followed by a quantitative phase that expanded the initial qualitative findings. This design focused on a phenomenon by gaining a thorough understanding of it, identifying primary themes, and then employing quantitative data to test and generalize results from the qualitative phase. This approach enables the researcher to construct grounded variables based on the strategies employed by the study participants. In addition, the qualitative design was used to identify the teaching strategies employed by teachers of multigrade classes in the SAMARICA district. In contrast, the quantitative design was used to describe the extent of these strategies, the level of mathematics performance of intermediate pupils in multigrade classes, and to determine their relationship.

Respondents of the Study - This research involves two key respondent groups from public schools in the Samarica District, Occidental Mindoro. The first group comprises 15 intermediate-grade school teachers, specifically those teaching grades 4 to 6 in multigrade classes. This group participated in the qualitative component of the study through an interview. They were chosen through simple random sampling to gather data on their teaching strategies. The second group consists of the total population, which is 514. After computing the sample size using Raosoft with a 5% margin of error and 95% confidence level, 225 respondents participated in the survey. They were randomly selected using stratified random sampling to ensure that the four (4) municipalities had an equal distribution of respondents. Moreover, among the municipalities, Magsaysay has the largest number of pupils and respondents, while San Jose has the fewest. Pupils in this group participated in the quantitative phase of the study, in which their mathematics skills were assessed using the Rapid Math Assessment (RMA), a curriculum-aligned measurement tool. Stratified random sampling was used to ensure an adequate distribution of student participants across grades and class types.

On the other hand, 70 teacher-respondents were randomly selected to administer questionnaires aimed at determining the extent to which teaching strategies were employed in teaching mathematics in multigrade classes. In terms of the grade levels, Grade 5 has the largest population, followed by Grades 4 and 6. The number of respondents from each municipality reflects the district's population, indicating that the principle of stratified random sampling was followed. Moreover, 70 teacher respondents from the SAMARICA District were included in the study. Magsaysay has the highest number of teacher respondents among all municipalities, with 33. The municipality with the fewest teacher respondents is San Jose, with only 7. In the distribution of teacher-respondents by grade level, grade 4 has the highest number, with 25. This is followed by grade 5, with 24 teacher-respondents, and grade 6, with 21.

Research Instrument - This research employed two primary instruments as part of the mixed-methods strategy: an interview guide for the qualitative part and a standardized Mathematics test (the Rapid Mathematics Assessment tool) and a researcher-made questionnaire for the quantitative part. To collect qualitative data, an interview guide was designed for teachers of grades 4-6 who teach multigrade classes. The interview questions aim to gather information concerning the teaching strategies employed in multigrade classes.

In the quantitative portion, a standardized Rapid Mathematics Assessment tool, used nationwide by the Department of Education, was administered to the intermediate pupil-respondents to measure their mathematics performance in multigrade classes. This is aligned with the K to 12 Curriculum Guide for Mathematics issued by the Department of Education. The reliability and validity tests have not been conducted because the administered test is a standard test from the Department of Education. Additionally, a researcher-made survey questionnaire was administered, divided into three variables: Active Learning Strategies, Differentiated Instruction, and Assessment and Feedback Mechanisms. The questionnaire used a five-point Likert scale: 5- Always; 4- Often; 3- Sometimes; 2- Seldom; 1- Never. Moreover, the researcher used the existing standardized mathematics assessment, the Rapid Mathematics Assessment, for grades 4 to 6. Validation is not required since the test is sourced from the Department of Education's standardized test.

For the reliability test of the survey questionnaire, the instrument was pilot-tested on 30 grade 4 to 6 pupils from Kalangigan Elementary School, Taguan Elementary School, Sulong Ipil Elementary School, and Puricon Elementary School in the MAPSSA District. This school was specifically chosen because, although it was not included in the actual study, it shared characteristics with the participating schools in the SAMARICA District. This design ensured that the pilot test results would not be biased by the primary data set. The results of the pilot test were then reviewed to assess the internal consistency of the test items administered to the final group of respondents in the SAMARICA district. The split-half technique was used, and the reliability coefficient was determined using Cronbach's alpha. Table 1 summarizes the reliability results for Cronbach's Alpha based on standardized items.

Table 1
Result of Reliability Analysis

| Items | Number of Items | Reliability Coefficients* | Analysis |
|---------------------------------------|-----------------|---------------------------|-----------------------|
| A. Active Learning Strategies | 10 | .842 | High Reliability |
| B. Differentiated Instruction | 10 | .886 | High Reliability |
| C. Assessment and Feedback Mechanisms | 10 | .947 | Very High Reliability |

*Based on standardized items

For the first two scales on active learning strategies and differentiated instruction, the result yielded Cronbach's alpha values of .842 and .886. In the context of psychometric research, these values are generally considered very good or highly reliable, as the coefficients ranged from .80 to .90 (DeVellis & Thorpe, 2021). This suggests that the items consistently measure the two constructs with minimal measurement error. The 10-item Assessment and Feedback Mechanisms scale demonstrated higher internal consistency, with a standardized Cronbach's alpha of .947, confirming that the item variances are consistent across the sample. According to widely accepted psychometric conventions, a coefficient alpha above .70 is considered acceptable, while values above .80 are regarded as good or highly reliable (Kline, 2023). All three scales demonstrate high levels of reliability, making them suitable for use in formal research settings. Overall, the results indicate strong internal consistency, supporting the use of the scales for further inferential statistical analysis with high confidence in the stability of the measurements. On the other hand, the Rapid Mathematics Assessment, designed for intermediate pupils, was used in the study. A reliability test is not required since the test is sourced from the Department of Education's standardized test.

Data Gathering Procedure - Data collection for the study was conducted in different phases, in accordance with the mixed-methods framework. As with any study, the necessary permissions were acquired from the Schools Division Superintendent of Occidental Mindoro, the District Supervisors of SAMARICA, and the School Heads of the participating institutions. In the qualitative phase, the researcher prepared interview guide questions for review by the research adviser. After the participants were identified through purposive sampling, printed and online materials were distributed via messenger to 15 teacher-respondents from the MAPSSA district who were teaching intermediate multigrade classes. The results of the interview conducted were used to formulate sub-variables. In the quantitative phase, the survey questionnaire was crafted from the formulated sub-variables. This questionnaire was examined and content validated by a group of experts from Divine Word College of San Jose and the experts from the Department of Education, Calintaan District. The survey questionnaire was then pilot-tested with 30 teacher-respondents from the MAPSSA district to establish its reliability. Moreover, the survey questionnaire was administered to the final respondent group in the SAMARICA district, comprising 70 teacher-respondents. Meanwhile, the standardized Rapid Mathematics Assessment, aligned with the K to 12 curriculum for grades 4 to 6, was administered to students in multigrade classes in the SAMARICA district. Stratified random sampling was employed to provide adequate representation from all grade levels. Their teacher administered the test. The test results were collected, coded, and statistically analyzed to assess the performance of intermediate pupils in multigrade classes. Finally, the researcher completed the survey in 15 days. The results from both phases were integrated to form a single, coherent explanation of the phenomenon under analysis: teaching strategies and mathematics performance among intermediate pupils in a multigrade setting.

Statistical Treatment of the Data - For this study, both quantitative and qualitative analysis techniques were applied using a mixed-methods approach. To analyze qualitative data, transcripts of the teacher interviews were prepared and subjected to thematic analysis. Codes were developed from the transcripts and then organized into categories, which were refined into key themes characterizing the teaching strategies and classroom practices that emerged from multigrade scenarios. This approach facilitated recognition of the same patterns and the different instructional strategies used in multigrade teaching. During the quantitative phase, the appropriate software tool (SPSS v.20) was used to perform statistical analyses to interpret the data the researcher had collected. Descriptive statistics of the respondents' data were displayed using the weighted mean, frequency, and percentage. These statistics were also used to capture the extent of the teaching strategies and the level of the pupils' mathematics performance. The Partial Least Squares Structural Equation Modeling (PLS-SEM) generated by the software WarpPLS version 7.0 was used to analyze the relationship between the extent of teaching strategies and mathematics performance. Computations were anchored at the .05 significance threshold.

Ethical Considerations - Data collection has been conducted with the authorization from the authorities of the Department of Education- the District Supervisors of the SAMARICA district, as well as the principals of the participating schools. Each participant received a thorough explanation of the aims and processes of the research so that they could make an informed decision about participation. For the qualitative segment of the study, informed consent was acquired from the teacher-respondents before the interviews were conducted. Participation was voluntary, and participants had the right to withdraw at any time without any repercussions. Recorded interviews were anonymized during transcription to ensure that all names and school identities were concealed, maintaining confidentiality. During the quantitative part of the study, children were asked to provide verbal assent. Assurance was given to pupils that their test results would be treated confidentially and would not affect their academic standing. All gathered information was kept confidential. It will only be accessed by the researcher and stored securely. Individual identities will be protected, as only summary information will be shared. Aggregate reporting was utilized to prevent identification. Furthermore, the ethical principles outlined by the American Psychological Association (APA, 7th edition) were used to provide credit to other research studies used as references. The sources and previous studies that formed the basis of the present study have been properly acknowledged and cited. These ethical protocols allow the study to adhere to ethical norms, safeguard participants' rights, and uphold their dignity during the research.

3. Results and Discussions

To determine the teaching strategies employed in multigrade classes, qualitative data were collected through interviews with teachers in grades 4-6. The responses were transcribed, coded, and analyzed using thematic analysis. From the clustering of formulated meanings, three major themes emerged, as shown in Figure 4, that describe the instructional practices of teachers in multigrade mathematics classes. The teaching strategies are Active Learning Strategies, Differentiated Instruction, and Assessment and Feedback Mechanisms. After the descriptions were categorized, the final thematic map of teaching strategies employed in mathematics instruction in multigrade classes, as shown in Figure 4, reveals three strategies. These include active learning strategies, differentiated instruction, and assessment and feedback mechanisms. This is noted in the study by Naparan (2021), which showed that effective instruction frequently involved peer tutoring, flexible grouping, and cross-grade thematic units. As shown in Figure 3, the participants demonstrated the teaching and learning strategy of scaffolding students' learning from concrete materials to abstract thinking, which is strongly advocated in mathematics education to promote conceptual understanding. Jones (2025) highlighted that interdisciplinary learning enabled teachers to be more efficient with diverse learners. Overall, this shows that differentiation is not an afterthought, but part of everyday instructional design. Teachers adjust the pace, the size of the group, the complexity of the task, and the structure of instruction to the level of heterogeneity in the class. The theme indicated a robust assessment culture in multigrade classes. Teachers are not only content deliverers but also track learners' progress.

Teaching strategies and mathematics performance of pupils in multigrade classes within SAMARICA

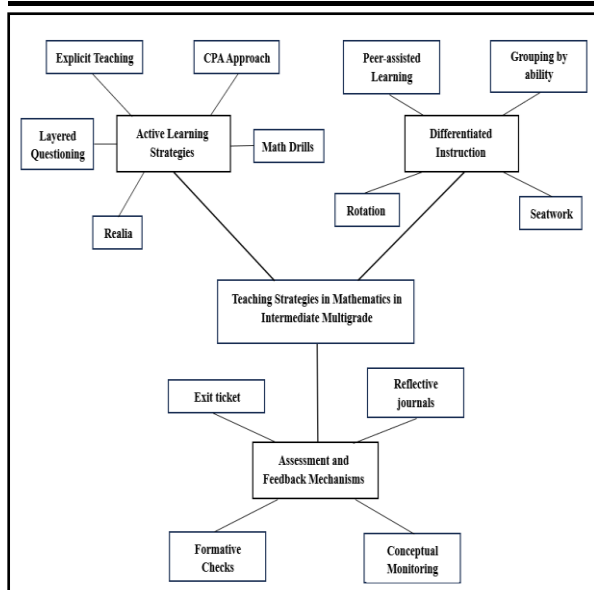


Figure 1. Initial Thematic Map for Teaching Strategies in Mathematics Instruction

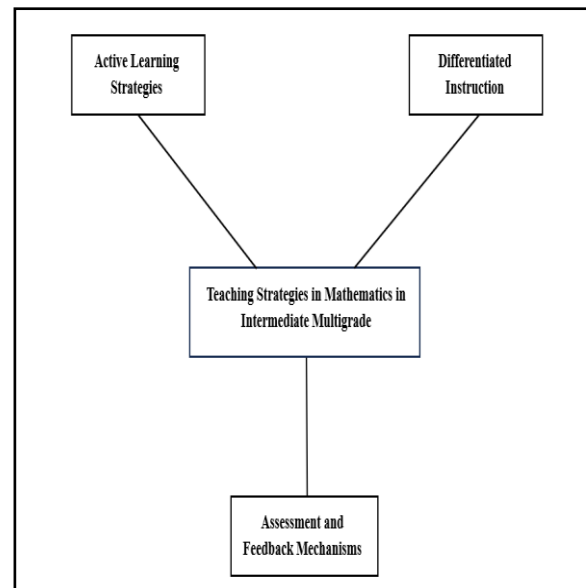


Figure 2. Final Thematic Map for Teaching Strategies in Mathematics Instruction

Table 2 shows the mean extent of teaching strategies employed, including active learning strategies, differentiated instruction, and assessment and feedback mechanisms, as well as the overall mean rating of teaching strategies used in the multigrade classes. The findings show all three primary instructional dimensions—Active Learning Strategies (4.71)—implying that multigrade teachers of Mathematics for Grades 4-6 in the SAMARICA District have incorporated active learning strategies in their lessons. This means that most teachers are said to have provided lessons with the learning intention linked to the K to 12 Curriculum, indicating a high degree of curriculum alignment and instructional clarity. Other indicators received high mean scores, suggesting that teachers often used developmentally appropriate strategies, adjusted instructional pacing to pupils' understanding, employed diverse instruction, and encouraged active participation during discussions. For Differentiated Instruction (4.70), this implies that, across multigrade mathematics classes in the SAMARICA District, Grades 4–6 teachers apply differentiated instructional practices consistently and systematically. Moreover, for Assessment and Feedback Mechanisms (4.76), they are interpreted as “Very High. This means that assessment-related practices are carried out regularly and intentionally by teachers of multigrade mathematics classes in the SAMARICA District. Thus, the overall mean of 4.72 confirms that teaching strategies in multigrade mathematics classes in the SAMARICA District are applied at a consistently high level. Assessment and Feedback Mechanisms (4.76) had the highest composite mean among the three dimensions, followed by Active Learning Strategies (4.71) and Differentiated Instruction (4.70). The results show that teachers tend to pay more attention to monitoring, evaluation, and feedback for learners.

Table 2

Mean Extent of Teaching Strategies Employed in terms of Active Learning Strategies, Differentiated Instruction, and Assessment and Feedback Mechanisms

| | Weighted Mean | Interpretation |
|---|---------------|----------------|
| Active Learning Strategies | | |
| 1. I deliver lessons with clear learning objectives aligned to the K to 12 Curriculum | 4.84 | Very High |
| 2. I use teaching strategies that are appropriate to the learner’s developmental level. | 4.66 | Very High |
| 3. I utilize instructional materials to clarify Mathematics concepts. | 4.63 | Very High |
| 4. I encourage active participation by allowing pupils to explain their reasoning during class discussions. | 4.71 | Very High |
| 5. I adjust my instructional pacing based on pupils’ level of understanding. | 4.70 | Very High |
| 6. I provide additional guidance to low-performing learners during the lesson | 4.69 | Very High |
| 7. I provide enrichment activities to advanced learners. | 4.67 | Very High |
| 8. I integrate real-life examples to contextualize mathematical concepts. | 4.79 | Very High |

| | | |
|---|-------------|------------------|
| 9. I use varied instructional strategies (discussion, guided practice, hands-on activities) | 4.67 | Very High |
| 10. I address immediately the misconceptions during instruction. | 4.71 | Very High |
| Composite Mean | 4.71 | Very High |
| Differentiated Instruction | | |
| 1. I establish clear classroom rules to maintain discipline. | 4.79 | Very High |
| 2. I allocate learning time efficiently across all grade levels I handle. | 4.69 | Very High |
| 3. I manage classroom activities to ensure all pupils remain engaged and on task. | 4.71 | Very High |
| 4. I use grouping strategies to balance participation among different grade levels. | 4.71 | Very High |
| 5. I provide individualized attention to pupils who need additional support. | 4.66 | Very High |
| 6. I manage learners' behavior calmly and consistently during Mathematics instruction. | 4.69 | Very High |
| 7. I encourage learners to follow established procedures during independent and group work. | 4.76 | Very High |
| 8. I reinforce positive behavior through praise and encouragement. | 4.69 | Very High |
| 9. The instructional time for Mathematics is used efficiently with minimal disruptions. | 4.60 | Very High |
| 10. Learners receive timely reminders when off-task. | 4.74 | Very High |
| Composite Mean | 4.70 | Very High |
| Assessment and Feedback Mechanisms | | |
| 1. I use a variety of assessment tools (e.g., quizzes, performance tasks, oral recitations) to evaluate learning. | 4.87 | Very High |
| 2. I provide timely and constructive feedback on pupils' work. | 4.80 | Very High |
| 3. I analyze assessment results to identify areas where pupils struggled. | 4.67 | Very High |
| 4. I modify my teaching strategies based on pupils' performance results. | 4.79 | Very High |
| 5. I communicate assessment results to pupils in a way that motivates them to improve | 4.74 | Very High |
| 6. I provide assessment tasks that are aligned with the lesson objectives. | 4.71 | Very High |
| 7. I use assessment results to adjust teaching strategies. | 4.70 | Very High |
| 8. Remedial activities are provided for learners who did not meet the mastery level | 4.71 | Very High |
| 9. Enrichment tasks are given to learners who demonstrate advanced understanding. | 4.70 | Very High |
| 10. Correct solutions and strategies are explained after assessments. | 4.89 | Very High |
| Composite Mean | 4.76 | Very High |
| Overall Mean | 4.72 | Very High |

Scale: 4.20-5.00 Very High; 3.40 -4.19 High; 2.60-3.39 Moderate; 1.80-2.59 Low; 1.00-1.79 Very Low

The uniformly high composite means across all dimensions suggest that teachers exhibit high levels of pedagogical engagement and organized instructional practices in multigrade classes. Teachers' use of participative active learning strategies demonstrates their efforts to engage learners in instruction. It aligns with Morphett (2025), who stated that in rural multigrade mathematics classes, participative and adaptive instructional practices are crucial for learning to take place. Moreover, Jones (2025) stated that when teachers are required to teach different levels simultaneously, their instructional effectiveness improves when they use interactive, responsive teaching strategies in the teaching-learning context. The consistent use of differentiated instruction is also in agreement with the findings of Shareefa (2021) and Naparan (2021), who stated that in multigrade classes where learners are at different levels in terms of readiness and capacity, teaching practices that are flexible in grouping learners, individualized support, and time allocation are important. Additionally, the robust assessment and feedback mechanism reflects the need for formative assessment and responsive instructional shifts. This is echoed by Simonson (2022) and Cleary (2022), who argued that the hallmark of effective teaching is the constant assessment of learner progress and instructional adjustments based on that assessment.

With a mean of 4.72, teaching practices are described as having become part of the instructional culture of the district's multigrade schools. The tight distribution of composite means indicates equilibrium, suggesting that schools with engagement-based strategies, differentiated practices, and assessment strategies demonstrate teachers' efforts to integrate three or more pedagogical strategies rather than using a single approach to teaching. In sum, the commitment of teachers in the SAMARICA District and their adherence to the principles of current mathematics teaching methodologies are remarkable.

Table 3*Mean Level of Mathematics Performance of Intermediate Pupils in Multigrade Classes*

| Score | Proficiency Level | Frequency | Percent |
|---------|-------------------|-----------|---------|
| 0 - 6 | Not Proficient | 41 | 18.2 |
| 7 - 13 | Low Proficient | 102 | 45.3 |
| 14 - 20 | Nearly Proficient | 66 | 29.3 |
| 21 - 26 | Proficient | 13 | 5.8 |
| 27 - 32 | Highly Proficient | 3 | 1.3 |
| Total | | 225 | 100.0 |

Table 3 shows the mathematics performance of intermediate pupils in multigrade classes, as measured by the Rapid Mathematics Assessment. Of the 225 pupils at the center of this assessment, most are in the lower proficiency categories. For example, 45.3% of the pupils, or 102 learners, are Low Proficient, while 18.2%, or 41 learners, are Not Proficient. Taken together, these figures show that 63.5% of pupils are below the expected level of proficiency in mathematics. On the other hand, 66 learners are Nearly Proficient. This shows that they are on the verge of mastery, though they currently lack the necessary competence. Very few learners demonstrated better proficiency. Only 5.8% (13 learners) are classified as Proficient, and 1.3% (3 learners) as Highly Proficient.

The finding shows that although teaching strategies in multigrade classes have been implemented consistently, most students have performed poorly in classroom activities. A significant number of students in the Not Proficient and Low Proficient categories indicate that they have not developed some core concepts in mathematics. This is likely due to the specific structural constraints of multigrade classes, in which one teacher must cover students from different grade levels, thereby limiting the amount of personalized instruction. According to Mulcahy (2022), multigrade teaching is compounded by structural and curricular obstacles, particularly when teaching and curriculum demands are split across different levels. Likewise, Motamedi (2020) observed that although some multigrade classes are structured to be efficient, there can be a lack of clear teaching and resources, resulting in these classes achieving lower results than more homogeneous classes.

In addition, Ares Ferreirós et al. (2025) remarked that gaps in the delivery and assessment of instruction in multigrade settings can be attributed to deficiencies in foundational mathematical skills. The adaptive strategies used by the teachers (as shown by the high implementation scores in the previous tables) have the potential to address gaps in essential mathematical skills. However, multiple curricula and varied levels of readiness may pose barriers. Moreover, Morphett (2025) highlighted that, to address the rural challenges of learner diversity and resource scarcity, multigrade teaching must be sustained and well supported.

Numerous learners have yet to reach the desired levels for the assessed competencies, as evidenced by the small percentage of learners recorded as Proficient or Highly Proficient. This signals a need for focused intervention programs to address foundational numeracy skills, targeted remediation, and systematic reinforcement. The Nearly Proficient group (29.3%) illustrates the potential to improve with sufficient support. The distribution of Nearly Proficient learners highlights the need for improved teaching and learner support in multigrade mathematics classrooms. Altogether, the evidence presented indicates a strong gap between the implementation of multiple teaching strategies and learners' outcomes, underscoring the need for focused teaching and support in the SAMARICA District.

The structural model in Figure 3 illustrates the impact of three teaching strategies: active learning (ACTLRN), differentiated instruction (DIFFINST), and assessment and feedback mechanisms (ASSESS) on the Mathematics performance (MATHPERF) of multi-grade elementary learners. The model utilizes standardized path coefficients and probability values (p) to determine the strength and significance of the relationships. The analysis used Partial Least Squares Structural Equation Modeling (PLS-SEM) generated by the software WarpPLS version 7.0. Computations are anchored at the .05 significance threshold. Beta coefficients ranged from -0.04 to -0.17, and p -values ranged from $< .01$ to .29. The structural model indicates that two of the three strategies are correlated with learners' Mathematics performance as measured by the Rapid Mathematics

Assessment (RMA) tool. The specific path coefficients and p-values are presented in the following table, which summarizes the results of the hypotheses.

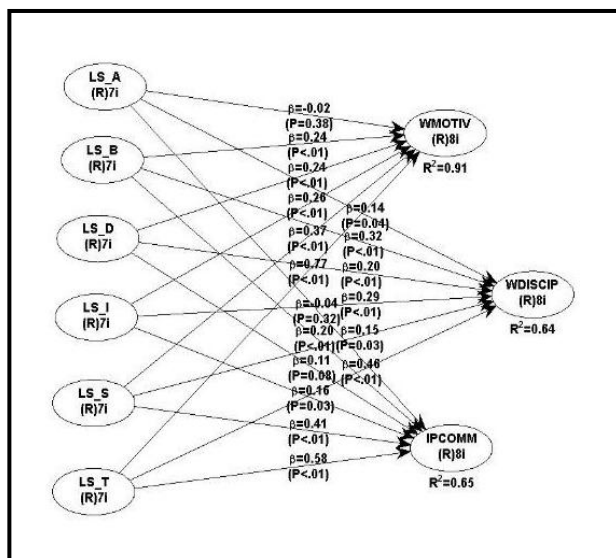


Figure 3. Structural Model of the Relationship Between the Extent of Teaching Strategies and Mathematics Performance

Table 4
Beta Coefficients of the Paths and p-values for Ho

| Paths | Beta (β) Coefficient | p-value* | Interpretation |
|---|------------------------------|----------|-----------------|
| Ho: Teaching Strategies→Mathematics Performance | | | |
| ACTLRN→MATHPERF | -0.037 | 0.289 | Not Significant |
| DIFFINST→MATHPERF | 0.111 | 0.046 | Significant |
| ASSESS→MATHPERF | -0.168 | 0.005 | Significant |

*Significant at $p < 0.05$

Table 4 shows the structural modeling results concerning the three teaching strategy constructs, Active Learning Strategies, Differentiated Instruction, and Assessment and Feedback Mechanisms, and the performance in Mathematics as evidenced by the Rapid Mathematics Assessment. Using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach at a significance level of $p < 0.05$, the results indicate varying degrees of impact across the teaching variables.

The regression of active learning strategies on performance in Mathematics tests yielded a Beta coefficient of -0.037 and a p-value of 0.289, indicating that this relationship is not statistically significant. Because the p-value is greater than 0.05, the null hypothesis for this path is not rejected, indicating insufficient statistical evidence that the degree of active learning strategies impacts Mathematics performance in the multi-grade context of this study. The descriptive findings in the previous sections suggest that, while active learning strategies were consistently evident, their implementation did not yield the improvement in pupils' test scores that the model predicted. This finding may stem from the intricacies of multigrade classrooms, where engagement-focused strategies, on their own, may not be sufficient to close major gaps in basic skills. Mulcahy (2022) pointed out that the structural and curricular challenges of multigrade classes are likely to undermine the potential of novel teaching methods to achieve better teaching outcomes, especially when there is a high degree of partitioning of instructional time among the various grades. In the same vein, Motamedi (2020) stated that although multigrade classes are likely to achieve a high degree of engagement, the lack of high-quality, focused instructional support is likely the reason for the lack of difference in academic outcomes. Additionally, Ares Ferreirós et al. (2025) observed that in multigrade environments, instructional methodologies that yield positive results necessitate systemic endorsement and consistent curriculum triangulation to enable documented improvement. Consequently, while constructive and active learning methods improve participation and

conceptual understanding, they cannot predict outcomes on standardized assessments without integrated, more precise differentiation strategies.

Additionally, differentiated instruction showed a significant positive correlation with Mathematics achievement, with a Beta coefficient of 0.111 ($p = 0.046$). Since the p-value is below the 0.05 threshold, the null hypothesis is dismissed. This means that as the number of differentiated instructional strategies aimed at a learner's readiness increases, mathematics achievement increases. This strongly supports the Framework for Differentiated Instruction (Tomlinson, 2014), which states that modifying the content, process, and product regarding the learner's needs will lead to better results. Multigrade classes have greater equity and higher learner achievement, with differentiated instruction that addresses varying cognitive levels, as noted by Shareefa (2021). In a study by Naparan (2021), the use of flexible group assignments, individualized instruction, and adaptive lesson planning was identified as a crucial factor in increasing academic achievement in multigrade classes. Well-considered, responsive teaching strategies reduce the impact of multigrade class structures, according to Morphett (2025). The present result solidifies the finding that differentiating instruction is the teaching strategy that has the greatest effect on improving Mathematics performance.

The relationship between the assessment and feedback mechanisms and Mathematics performance has been established and recorded, with a Beta of -0.168 and a p-value of 0.005. With the p-value being less than the 0.05 level of significance, the hypothesis for this path is rejected. Along with the Beta value, which indicates an inverse relationship, this suggests that an increased focus on assessment strategy is correlated with decreased performance in Mathematics. This might signal quality over quantity, although it should seem very much circular. This most probably means that the number of evaluations and assessments outweigh the refined practice and the practice and assessment goals - meaning they are a checkmark. In a study by Mulcahy (2022), in multigrade classes, a greater focus on evaluation and documentation may divert attention from teaching, limiting opportunities for learners to master a concept. In a study by Ares Ferreirós et al. (2025), it was argued that an assessment framework in multigrade classes, where learning gaps exist and go unaddressed, may cause serious, fundamental gaps in learning. Simonson (2022) argued that assessments will improve performance only when they are formative and provide direction for the learner's practice; otherwise, they are only evaluative measures that do not benefit learning. The different feedback and evaluation systems may be responsible for the significant inverse relationship observed in this study.

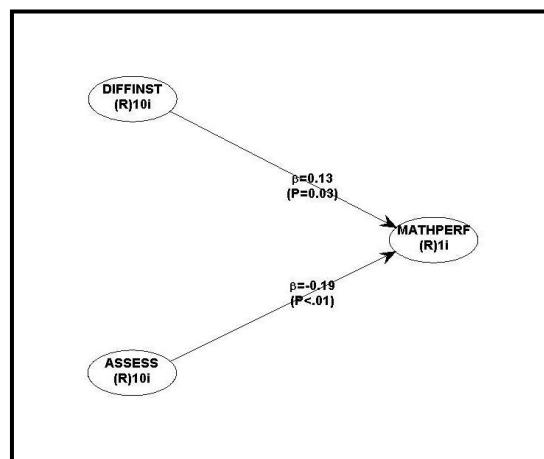


Figure 4. The Emerging Model of the Relationship Between the Extent of Teaching Strategies and Mathematics Performance

The structural model illustrates that consistently observed teaching strategies impact Mathematics performance differently. Active learning strategies, for example, did not significantly predict achievement outcomes. Differentiated instruction, however, was shown to be a positive, significant contributor to performance and, therefore, confirms the importance of this teaching strategy in multi-grade pedagogy. The opposite was true for assessment practices, which were consistently implemented but showed an inverse relationship with

performance. This indicates that the way assessments are designed and the role they play in instruction must be revised. These findings suggest that bottom-up educational practices alone are insufficient. The application of teaching strategies must be deliberate in supporting mastery and conceptual understanding goals in multigrade Mathematics classes.

The emerging model in Figure 4 focuses on the two teaching strategies that remained statistically significant following the structural equation analysis. By removing the non-significant paths, the model highlights the most influential variables within the multigrade elementary context. Rounded-off values of the Beta coefficients, 0.13 and -0.19, with corresponding p-values < .01 and p = .03, are reflected in the new model.

Table 5

Standardized Estimates of the Path in the Emerging Model

| Hypothesis | Standardized Estimates (β) | Standard Error | p-value* | Effect Coefficient** | Effect Size |
|---|------------------------------------|----------------|----------|----------------------|-------------|
| Ho: Teaching Strategies→Mathematics Performance | | | | | |
| DIFFINST→MATHPERF | 0.125 | 0.065 | 0.028 | 0.033 | Small |
| ASSESS→MATHPERF | -0.186 | 0.064 | 0.001 | 0.052 | Small |

*Significant at $p \leq 0.05$

** Effect size coefficient: 0.02 – small, 0.15 – medium, 0.30 – large

The developing model shown in Table 5 improves structural analysis by retaining only those teaching strategy variables relevant to predicting Mathematics outcomes. The omission of the non-significant path from active learning strategies emphasizes the most prominent instructive constructs in the multi-grade context. The analysis reveals that differentiated instruction and the assessment and feedback cycles, despite small effect sizes, are still relevant predictors of Mathematics performance. The contribution of differentiated instruction to Mathematics performance has a standardized estimate (β) of 0.125 and a p-value of 0.028, which is significant at the 0.05 level. Although the effect size of 0.033 is considered small, it still corroborates the fact that differentiated instruction plays a role in improving learners’ achievement in Mathematics. The positive outcome of the null hypothesis for this path suggests that differentiated instruction has a positive effect, even though the effect is small. The findings align with Shareefa (2021), who noted that differentiated instruction fosters equitable learning in multigrade classrooms by tailoring learning objectives, teaching strategies, and assessments to learner readiness. Naparan (2021) reported that in multi-grade classrooms, learning through various mechanisms (e.g., flexible grouping) and individual attention are direct conduits to increased learner participation and improved academic results. Additionally, Morphett (2025) stated that in rural multigrade classrooms, the application of adaptive and responsive teaching is essential to overcoming the learning difficulties of a heterogeneous learner population. The positive coefficient in the emerging model confirms the theory of Differentiated Instruction and suggests that differentiated teaching and learning approaches are essential to improving Mathematics achievement in multigrade classes.

In comparison, the route from feedback and assessment mechanisms to Mathematics performance has a p-value of 0.001 and a β of -0.186, indicating a statistically significant inverse relationship. The effect coefficient of 0.052 is also very small, but the negative sign indicates that as assessment practices increase, Mathematics performance is likely to decrease. This means that assessment practices may be used frequently, but there is a chance they are not used correctly and therefore do not lead to improved achievement. Mulcahy (2022) observed that in multigrade classes, significant administrative and evaluative processes reduce the time available for instruction, and students may not be able to master concepts within that time. Furthermore, Ares Ferreirós et al. (2025) observed that inconsistent assessment implementation is not complemented by adequate remediation, which may also lead to students lacking critical elementary mathematical skills. Simonson (2022) also stated that assessment can only aid the learning process as a formative tool, not as a summative evaluation. If the assessment is overly focused on itself rather than on the instruction it should provide, there may be an increase in learners’ anxiety about the assessment. For this reason, the negative correlation in this study might be due to a lack of evaluative practices.

Low standard error estimates are observed in both model pathways, with 0.065 for differentiated instruction and 0.064 for the assessment and feedback mechanisms. The model's precision is also attributable to the standard error estimates, which are close to zero. Low effect sizes indicate that differentiated instruction and assessment practices do influence Mathematics performance, but only partially, as is likely in a more complex, interconnected system of variables in multigrade classes. Other variables, such as structural constraints, resource availability, curriculum pacing, and learner readiness, may also influence performance in multigrade classes.

The model calls for a more thorough review of the assessment practices used. From the findings, it is evident that assessment practices, in addition to ensuring that instruction is adaptive and learner-centered, must facilitate remediation and mastery of content, rather than merely serving as evaluative assessments that are not integrated with the rest of the system.

Table 6
A Proposed Intervention Program DAMAY
Differentiated Approach for Mastery and Achievement of Young Learners

| Activities | Assigned Agency | Objective | Suggested Implementation | Time Frame | Success Indicator |
|---|--|--|--|-----------------------------------|---|
| Differentiated Instruction Training | School Management, Master Teachers, Teachers | To strengthen teachers' capacity to implement differentiated instruction strategies in multigrade Mathematics classes | Professional development sessions may be conducted to provide teachers with training in differentiated instruction, with specific emphasis on tiered assignments, scaffolding strategies, and vertical curriculum mapping appropriate for Grades 4-6 students. Teachers may also be trained to create mastery-based tasks and flexible pacing guides appropriate for multigrade classes. | Before and during the school year | Strengthened teacher competence in differentiation |
| Foundational Numeracy Recovery and Enrichment Sessions | Teachers, School Management | To improve foundational numeracy skills among students identified as Not Proficient and Low Proficient in Mathematics | Weekly structured remedial sessions may be implemented, focusing on number sense, the four operations, and problem-solving. Learning difficulties may be addressed through intensive small-group work, whereas near-proficient learners may receive reinforcement activities. | Throughout the school year | Increased percentage of pupils reaching Nearly Proficient and Proficient Levels |
| Assessment Recalibration and Formative Feedback Enhancement | Teachers, School Management | To improve the effectiveness of classroom assessment and utilize assessment data to guide instruction and remediation strategies | Shift focus from regular summative assessments to diagnostic and formative assessments. Teachers may utilize tools such as exit slips, mastery trackers, and formative feedback systems to monitor students' progress. Assessment results may be used for remediation. | Quarterly monitoring | Improved Mastery of Foundational Skills |

| | | | | | |
|--|---|--|--|----------------------------|---------------------------------------|
| Instructional Time Optimization in Multigrade Settings | Teachers, School Management | To maximize instructional time and ensure effective learning delivery in multigrade classes | A rotational teaching model may be adopted in which the teacher creates learning stations, independent work banks, and guided practice modules. This model may provide one grade level with the chance to work independently, while the other receives direct instruction. | Throughout the school year | Optimized teaching time |
| Monitoring and Evaluation Framework | School Management, Teachers, District Supervisors | To monitor the effectiveness of the intervention program and track improvements in student mathematics performance | School management may conduct baseline Mathematics assessments prior to program implementation and quarterly progress monitoring. | Quarterly | Improved tracking of performance data |

Given the results of the study, particularly the percentage of students categorized as Not Proficient and Low Proficient, and the positive impact of differentiation, coupled with the negative impact of the assessment practice paradox on student achievement in Math, we have created an intervention proposal. The goal of the intervention is to improve students' foundational numeracy skills and to guide teachers in implementing differentiated instructional practices and improving assessment practices to support learning toward mastery rather than assessing student performance. The intervention proposal is called Project D.A.M.A.Y., which stands for Differentiated Approach for Mastery and Achievement of Young Learners. The word “damay” means “to understand,” symbolizing collaboration among teachers, school management, and students to achieve better results in Math across multigrade classes.

The program's first component is Enhanced Differentiated Instruction Training. Given that differentiated instruction positively impacted student achievement in Math, we may focus our professional development efforts on helping teachers create tiered assignments, scaffolded problem-solving, and flexible ability groupings. Workshops may focus particularly on vertical curriculum mapping for grades 4 to 6 to ensure that competencies are integrated and instruction remains challenging. Lastly, teachers may be equipped to develop mastery-based tasks and flexible pacing guides for multigrade classes. The second component focuses on the Foundational Numeracy Recovery and Enrichment Sessions. Considering that 63.5% of students are Not Proficient or Low Proficient, weekly structured remediation periods may be added to the school schedule. These will cover number sense, the four operations, problem-solving, and the underlying concepts. Students flagged as having learning difficulties will be supported through intensive small-group teaching, and students just short of proficiency will be involved in teaching-led reinforcement activities.

To avoid stagnation and encourage the development of higher-order thinking skills, advanced students will be offered enrichment activities. This means that students will be offered varying levels of activities based on their levels. The third section covers Assessment Recalibration and Formative Feedback Enhancement. The consistent implementation of assessment practices suggests an inverse relationship with performance. There is a need to refine their design and purpose. The intervention proposes reducing the reliance on frequent summative assessments and shifting the focus towards diagnostic formative assessments. Teachers will be instructed to use assessment data to inform remediation strategies rather than record performance data (Fuchs et al., 2025). Feedback will focus more on correcting concepts, improving strategies, and monitoring progress. Formative assessment tools will include exit tickets and mastery trackers, standardized to ensure alignment with lesson objectives and to avoid losing instructional time to excessive assessments.

The fourth component deals with Instructional Time Optimization in Multigrade settings. Multigrade classes

have structural constraints and therefore need to use a rotational teaching model. Teachers will be required to set up learning stations, independent work banks, and guided practice modules so that one grade level can work productively while the rest of the class receives direct instruction (Lombardi, 2018). This will help ensure that instruction is distributed equitably and that teaching time is optimized. The fifth component is the Monitoring and Evaluation Framework. Before implementation begins, we may collect baseline Mathematics assessment results and then do quarterly progress monitoring. Using performance data, we will analyze trends in improvement, especially among pupils previously identified as Not Proficient and Low Proficient. Instructional strategies will be adjusted based on data collected during implementation.

The outcomes for Project D.A.M.A.Y. are to raise the percentage of pupils reaching Nearly Proficient and Proficient levels, improve mastery of foundational skills, strengthen teacher competence in differentiation, and more purposeful use of assessment data. By integrating empirical evidence from the study into intervention strategies, the program fills the structural model and performance gaps. The intervention program focuses on differentiated mastery instruction, structured remediation, assessment refinements, and instructional efficiency to improve Mathematics performance in multigrade classes. Through systematic implementation and continuous monitoring, the program is designed to reduce the gap between the consistently delivered teaching and the learning outcomes in the SAMARICA District.

4. Conclusions

Based on the summary of the findings presented, the following conclusions are drawn: The teaching strategies employed within SAMARICA multigrade classes are active learning strategies, differentiated instruction, and assessment and feedback mechanisms. Teachers have incorporated these strategies in the delivery of their lessons. It shows that these strategies are common practices across multigrade classes in the district. These teaching strategies illustrate that teachers are not only content deliverers but also track learners' progress. Teachers demonstrated a strong pedagogical engagement and organized instructional practices in multigrade classes. Teachers have provided developmentally appropriate lessons, and active participation is encouraged during discussions. Teachers in multigrade classes apply differentiated instructional practices consistently and systematically. Feedback and assessments are widely used in multigrade classes. Most pupils have achieved low performance levels. Most pupils have not developed core concepts in Mathematics, a gap in foundational mathematical skills. There is an inverse relationship between active learning strategies and the Mathematics performance of intermediate pupils, meaning that while these strategies were consistently observed, their implementation did not improve pupils' performance. Engagement-focused strategies may not be enough to remove the gap in mathematical skills. However, the contribution of differentiated instruction, assessment, and feedback to the mathematics performance of multigrade classes is vital to improving pupils' achievement in Mathematics. The proposed intervention would increase the percentage of pupils reaching the Proficient level and could improve mastery of foundational mathematics skills.

Recommendations - Based on the study's conclusions, the following recommendation is proposed: Teachers may strengthen the implementation of differentiated instruction, assessment, and feedback mechanisms in multigrade classes, as these strategies were found to have a significant positive relationship with Mathematics performance. Teachers may continue and further enhance their use of these strategies. Teachers may optimize instructional time in multi-grade settings through structured rotational teaching models. Teachers may emphasize the use of explicit instruction in the active learning strategies. Teachers may continue to enhance the use of tiered activities and flexible grouping. Teachers may emphasize using assessment results that directly inform remediation to guide corrective instruction and conceptual reinforcement. At the level of Mathematics performance, given that the majority of pupils were marked as low-proficient, schools may institutionalize targeted remediation sessions focusing on number sense, basic operations, and problem-solving skills. Small-group instruction and mastery-tracking systems may be introduced to ensure that struggling learners receive adequate support. Given the significant inverse relationship between active learning strategies and Mathematics performance, teachers may emphasize differentiated instruction, assessment, and feedback

mechanisms. School administrators may provide professional development programs to teachers focusing on advanced differentiation techniques. They may support teachers in developing organized schedules that allow equitable instructional exposure across grade levels. Administrative and institutional support for multigrade schools may be strengthened. The Department of Education and school leaders may consider providing intervention programs and activities tailored to the needs of multigrade teachers. Additional instructional materials and contextualized teaching resources are designed specifically for multigrade realities to address systemic constraints affecting learner performance. Future researchers may explore additional variables influencing Mathematics performance in multigrade contexts. Future studies may examine factors such as socioeconomic background, instructional time allocation, teacher experience, learner motivation, and resource availability to provide a more comprehensive understanding of achievement outcomes. These recommendations aim to bridge the gap between consistently implemented teaching strategies and actual learner achievement outcomes, ensuring improved Mathematics performance among intermediate pupils in multigrade classes.

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