
Effectiveness of Differentiated Mathematics Instruction to the Performance of Grades 3 and 4 Pupils: Basis for Instructional Supervision

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ABSTRACT

As pupils in today's schools are becoming more academically diverse, teachers must consider the types of activities they plan for their learners. It is therefore important to pay attention to the level and the degree of challenges of these activities (SMU, 2022) by also considering the students choice of learning task based on their readiness, interest, and profile (Sherma & Catapano, 2011). As it is relevant in today's educational needs, differentiated mathematical instruction has come into being knowing that most of the pupils in field have different needs, abilities, and styles in learning. Hence, this study is crafted to evaluate the effectiveness of differentiated mathematics instruction to the performance of grades 3 and 4 pupils. A proposed instructional supervision plan was developed based on the findings of the study. A quasi-experimental research design employing a teacher-made test to measure the performance of the Grades 3 & 4 pupils before and after the implementation of the intervention. Simple percentage and t-test of mean difference were the statistical tools used to interpret the result of the study. Based on the study's finding, differentiated mathematical instruction as used in teaching with varied and differentiated learning materials and activities closes the learning gaps of the Grades 3 & 4 pupils as it was revealed a significant difference in the performance before and after the implementation of the intervention. This teaching approach allows teachers to tailor their instruction to meet the individual needs of each pupil, considering their unique learning styles and abilities. Through the implementation of differentiated mathematical instructions, the performance of the pupils improved in terms of proficiency and self-assurance. This is likely since Grades 3 & 4 pupils were able to receive instruction that was specifically targeted to their learning needs and styles, allowing them to engage more fully with the material and develop a deeper understanding of the concepts being taught.

Keywords — *Effectiveness, Differentiated Mathematical Instruction, Performance, Grades 3 & 4 Pupils, Instructional Supervision*

I. INTRODUCTION

Mathematics is considered one of the most difficult subjects for some of the pupils, especially in key stage 2. It takes a lot of understanding and analysis of the concepts for the grade level. It involves using logical reasoning and systematic approaches to solve problems and explore abstract concepts.

To promote effective mathematical learning, teachers must consider various factors, including pupils' confidence in mathematics (Azucena et al., 2022; Kunhertanti & Santosa, 2018). However, capturing the necessary type of confidence in mathematics is challenging, as pupils' overall assessments of their confidence in mathematics or specific

topics within the mathematics curriculum may not accurately reflect their actual confidence (Foster, 2016). After almost two years of being implemented distance learning, most of the pupils if not all struggled in achieving positive Mathematics performance, making them non-numerates in the numeracy performance conducted by the teachers.

At present, teachers and school leaders are taking steps on how the pupils can recover the learning losses during the pandemic. Going back to the end of the school year activities, the Department of Education launched the National Learning Camp as one of the strategies to address learning gaps, especially in Mathematics. After assessing the performance of the pupils, it was revealed that there are many factors which contribute to the inability of the pupils to achieve the desired competencies for the grade. One of which is the confidence of the pupils to tackle mathematical problems and analyzing such to arrive at the correct solutions. It was found out that it is necessary to deal with the problem of pupils' confidence in mathematics and develop effective strategies to enhance mathematics education in the school. By doing so, students can better develop their mathematical thinking and problem-solving skills, leading to improved performance in mathematics and other academic areas.

Moreover, it was found out that during the 1st quarter of this school year, there are still pupils who found difficulty in remembering the lessons learned, they cannot grasp and recall their homework, and some concepts were forgotten even a day or two pasts. Teachers are fully aware of the decline in education that has occurred during the past few months. Because of the pandemic, all pupils' learning gaps widened. Their learning gaps were most noticeable in mathematics, where most needed help solving integer-based problems or equations. Nevertheless, it can be addressed through an intervention (Azucena et al., 2022; Pentang et al., 2020; Pentang, 2021).

The school sought more interventions to bridge the gap and achieve pupils' learning outcomes, especially during the transition to face-to-face classes. The priorities and action steps include expanding the implementation of limited face-to-face classes, identifying learning gaps, and profiling and clustering learners based on learning needs. Developing learning time is one of the strategies to address learning gaps and accelerate learning (Suprayogi, 2017). Other instructional strategies, such as peer tutoring, problem-based learning, and gaming, may be used in differentiated instruction (Altemueller & Lindquist, 2017; Smale-Jacobse et al., 2019). Differentiated instruction was chosen to help students recover quickly, bridge learning gaps, and improve academic performance. The confidence was added to understand the level of difficulty that they have while answering. Differentiated instruction was used because teachers knew how capable those students were; their potential could not be ignored. It was partially implemented in the 1st 8 weeks of classes where key stage 1 teachers use differentiated instruction in teaching literacy and numeracy. Moreover, multigrade classes have adapted this teaching strategy considering that a teacher is catering two or more grade levels in one class.

Differentiated instruction is a strategy that can effectively meet the diverse needs of all students, leading to improved student achievement (Parsons et al., 2018; Valiandes & Neophytou, 2018). This approach considers learners' unique strengths and differences in today's classrooms and provides them with hands-on learning opportunities (Civitillo et al., 2016). When teaching mathematics, differentiated instruction promotes greater student engagement and interaction among classmates (Mbugua & Muthomi, 2014).

Thus, it is in the above premise that the researcher decided to conduct this study to evaluate the effectiveness of differentiated mathematics instruction in improving the performance of the Grades 3 & 4 pupils of Consolacion Elementary School, Isabel I District, Leyte Division for school year 2023-2024. A proposed improvement plan will be formulated based on the result of the study.

It is in the rationale that the researcher who is currently a grades 3 & 4 teacher in the above mentioned local, would like to delve worthy research undertaking that will benefit herself, the school she is currently teaching and that of her Graduate Program she is enrolled at.

This study evaluates the effectiveness of differentiated mathematics instruction to the performance of grades 3 and 4 pupils as basis for a proposed instructional supervision plan in Consolacion Elementary School, Isabel I District, Leyte Division for School Year 2022-2023. The findings of the study were the basis for the proposed instructional supervision plan.

Specifically, this study sought to answer the following questions:

1. What is the performance of the grades 3 and 4 pupils before the implementation of differentiated mathematics instruction?
2. What is the performance of the grades 3 and 4 pupils after the implementation of differentiated mathematics instruction?
3. Is there a significant difference in the performances of the grades 3 and 4 pupils before and after the implementation of differentiated mathematics instruction?
4. What instructional supervision plan can be proposed based on the findings of this study?

II. METHODOLOGY

Design. This study employed the quasi-experimental research design utilizing the pre-test and post-test to evaluate the effectiveness of differentiated mathematics instruction to the performance of Grades 3 & 4 pupils as basis for instructional supervision for School Year 2023-2024. Consolacion Elementary School, Isabel I District, Leyte Division is the main locale of the study. The 20 Grades 3 & 4 pupils enrolled in the said locale are the main respondents of the study. The instrument used in this study is a researcher-made test questions in Mathematics which covers the second quarter Most Essential Learning Competencies (MELCs) for Grades 3 and 4. This is a 30-item test question. This was conducted before and after the implementation of differentiated mathematics instruction. Further, the researcher prepared lesson plans in Mathematics for the two grade levels. The strategy used in teaching the subject is differentiated instruction utilizing differentiated activities and learning materials based on the needs of the pupils. The materials, lesson plans and assessment tools were checked and validated by the District Math Coordinator and school Heads before it was administered to the pupils. A Matrix of Activities was formulated to track the progress of the intervention. This research focused on evaluating the effectiveness of differentiated mathematics instruction to the performance of Grades 3 & 4 pupils through the pre-test and post-test and its significant difference. A Proposed Instructional Supervision Plan based on the findings of the study is the output.

Sampling. There are 20 Grades 3 & 4 pupils involved in this study. They are the pupils enrolled in the grade for School Year 2023-2024 in the said locale. Complete enumerations were used to identify the respondents of the study. A researcher-made test was used as a tool and the implementation of the intervention was administered personally to each of the pupils during the assessment period following the prescribed health protocol.

Research Procedure. The researcher prepared the research design and tools utilized in the study. Approval and recommendation from the Panel of Examiner of the Graduate Studies was sought. A letter request to conduct this study

was forwarded to the Office of the Schools Division Superintendent. Upon approval, permission from the District Supervisor and School Head was secured before the actual gathering of data. Orientation of the participants and administration of the pre-test was done during the assessment period for the class after the approval of the permit from the parents of the respondents. Data privacy was emphasized also in the meeting. After accomplishing the pre-test, intervention was given within four weeks. Implementation of differentiated mathematics instruction with appropriate and varied learning materials and activities highlight the provision of intervention in the delivery of the lesson in Mathematics to the Grades 3 & 4 pupils was emphasized in the study. After the four-week intervention, the post-test was administered. Results of the tests were collected. Data were tallied and submitted for statistical treatment. Analysis and Interpretation of Data. Making of Proposed Instructional Supervision Plan followed.

Ethical Issues. The researcher properly secured the permission to conduct the study from the authorities through written communication. In the formulation of the intervention materials that was used in the study, the use of offensive, discriminatory, or other unacceptable language was avoided. The respondents' names and other personal data were not included in this study to protect their privacy. Participation of the respondents was also voluntary. Orientation was conducted for the respondents with their parents. In the orientation, issues and concerns were addressed and consent to be included in the study were signed. The researcher-maintained objectivity in analyzing and discussing the results. All authors whose works were mentioned in this study were properly quoted and were acknowledged in the reference.

Treatment of Data. Simple Percentage was employed to evaluate the performances of grades 3 & 4 pupils before and after the implementation of differentiated Mathematics instruction. **t-Test of Mean Difference** was used to determine the significant difference in the performances of grades 3 & 4 pupils before and after the implementation of differentiated Mathematics instruction.

III. RESULTS AND DISCUSSION

TABLE 1

PRE-TEST PERFORMANCE OF GRADE 3 AND 4 PUPILS IN MATH

Score Range	Description	PRETEST	
		Frequency	%
25-30	Excellent	2	10
19-24	Very Good	0	0
13-18	Good	10	50
7-12	Fair	4	20
1-6	Poor	4	20
Total		20	100
Weighted Mean		13.50	Good

Table 1 presents the pre-test performance of the Grades 3 & 4 pupils before the implementation of differentiated mathematics instruction in teaching the subject. It was revealed on the table that among the 20 pupils, there are 4 or 20% got a score of 1-6 which is interpreted as poor. This means that they struggled to achieve the desired learning outcomes due to insufficient or unmastered skills or maybe due to lack of personalized and responsive teaching strategies. This implies that the traditional one-size-fits-all approach in teaching mathematics may not have effectively addressed the diverse needs of the pupils, leading to poor performance. This implies further that teachers need to address these challenges by tailoring the teaching strategies, methods and content to individual's needs, abilities, and learning styles.

Moreover, it was shown on the table that among the 20 grades 3 & 4 pupils tested, 4 or 20% got a score of 7-12 which is interpreted as fair. This means that there are competencies of which the pupils were not mastered. The pupils achieved satisfactory and equitable results in their mathematical learnings. This implies that the performance of the pupils were consistent with the standards, and there were no significant disparities among the pupils in terms of their understanding and application of mathematical concepts but the implementation of differentiated approaches aims to further enhance their learning experiences.

Further, the table also revealed a good performance where 10 or 50% got a score of 13-18. This means that these pupils consistently achieved high-quality results in their mathematical learnings. This implies that these pupils were meeting or exceeding expected standards in mathematics. However, it is essential to recognize that achieving consistent excellence can be challenging due to the diverse needs, abilities, and backgrounds of the pupils. The traditional uniform teaching approach might not have fully addressed these individual differences.

Additionally, the table shows that among the 20 pupils tested, 2 or 10% got a score of 25-30 which is interpreted as excellent. This means that these pupils got exceptional performance in Math, they have mastered the skills, and they demonstrated a strong understanding of mathematical concepts, problem-solving skills, and the ability to apply mathematical knowledge effectively. Excellent performance implies that these pupils were meeting or exceeding expected standards even before the implementation of differentiated mathematics instructions. The intervention to be given to them will continue to support their growth and achievement.

Finally, the performance of the Grades 3 & 4 pupils before the implementation of differentiated mathematics instruction got a weighted mean of 13.50 which is interpreted as good. This means that there are pupils who have excelled

higher than expected even before the implementation of differentiated mathematical instruction. This implies that good performance indicates that pupils were excelling in their mathematical learning, and the implementation of differentiated mathematics instruction aims to continue support the pupils to achieve the desired learning outcomes and to achieve excellence in all the learning competencies in Math for the grade. Different creative instruction techniques in the way that differentiated instruction are used to raise mathematics achievement (Kyriakides et al., 2018; Schleicher, 2016; UNESCO, 2017). Differentiation entails tailoring instruction to address the needs of everyone, where teachers have made a difference in subject matter, procedures, outputs, and student experience (Wilkinson & Penney, 2014; Smale-Jacobse et al., 2019). The idea behind differentiated instruction is that educational strategies should change and be tailored to the unique needs of each student in a classroom instead of expecting students to modify themselves for the curriculum (Roy et al., 2013; Tomlinson, 2014; Tomlinson, 2015). The differentiated instruction model calls for teachers to adapt and be flexible in teaching methods, curriculum, and informational delivery to learners (Mbugua & Muthomi, 2014).

TABLE 2

POST-TEST PERFORMANCE OF GRADE 3 AND 4 PUPILS IN MATH

Score Range	Description	POST TEST	
		Frequency	%
25-30	Excellent	16	80
19-24	Very Good	3	15
13-18	Good	1	5
7-12	Fair	0	0
1-6	Poor	0	0
Total		20	100
Weighted Mean		27.45	Excellent

Table 2 provided the performance of the Grades 3 & 4 pupils after the implementation of differentiated mathematical instruction. It was revealed on the table that among the 20 grades 3 & 4 pupils tested, only 1 pupil or 5% got a score of 13-18. This means that this pupil has mastered the lessons in Math and perform high-quality standard. This implies that the intervention given has supported the pupils to achieve good performance. Further, there are 3 or 15% got a score of 19-24 which is very good. This means that these pupils excel higher than standard. They demonstrated a deep understanding of mathematical concepts, strong problem-solving skills, and the ability to apply mathematical knowledge effectively in their day-to-day activity. This implies that the differentiated mathematical instruction had helped in enhancing the learning experiences of the pupils. By recognizing their individual learning needs and providing the appropriate learning resources, excellence in Mathematics was achieved. Moreover, the table also shows that 16 or 80% got a score of 25-30 which is interpreted as excellent. This means that these pupils show notable improvement or achievement following the adoption of a teaching approach that is suited to individual pupils' needs. This implies that the intervention provided to the pupils had made them able to increase their engagement in all the activities provided, their understanding of the lesson was made easier for the activities were all suited to their levels and proficiency in mathematical concepts and problem-solving was achieved. This is consistent with Azucena et al. (2022), where instructional intervention can effectively address students' mathematics performance. In a recent study by Valiandes (2015), compared to children in classes where differentiated instruction methods were used, it was discovered that students made higher progress in classrooms where differentiated instruction methods were used consistently.

TABLE 3
TEST OF DIFFERENCE BETWEEN THE SCORES IN THE PRE-TEST AND POST-TEST PERFORMANCE OF GRADE 3 AND 4 PUPILS IN MATH

Aspects	Test Scores		Computed T	Critical T	Decision	Interpretation
Grade 3 and 4 Pupils in Math	Pre	13.50	2.556	0.521	Reject H ₀	Significant
	Post	27.45				

Table 3 presents the test of difference in the performances of Grades 3 & 4 pupils before and after the implementation of differentiated mathematical instruction. It was revealed on the table that the performance of the Grades 3 & 4 pupils before the implementation of differentiated instruction has an average mean of 13.50 which increases to 27.45 after the implementation of the intervention. Based on the data, the computed t of 2.556 is greater than the critical value of t of 0.521, so null hypothesis is rejected. This means that there is a significant difference in the performances of Grades 3 & 4 pupils before and after the implementation of differentiated instruction. This implies that tailoring the activities to the needs and abilities of the pupils and providing them with the appropriate materials where they are engaged and motivated to do the tasks given them had contributed much to the attainment of the objectives of this study. Thus, adoption of teaching approaches where pupils must work on the activities and materials suited to their needs, abilities, and capabilities had made the differentiated mathematical instruction an effective strategy in teaching the subject to help the pupils develop and improve their mathematical performance. Hence, the findings of Stravroula's (2011) study on DI proves that differentiated instruction was effective and positively affects the diverse pupils' characteristics. The study of Westbrook (2011) also revealed that students' learning has improved after differentiating the instruction based on the learners' preferred learning styles. With that, students are more aware of their preferred learning styles and feel more confident to gain knowledge by the means of it. Moreover, students' test results improved significantly once their preferred learning method was incorporated into the instruction, according to Fine (2003). When students were taught using learning style techniques rather than standard teaching methods, their results were much better. This simply means that when students are differentiated based on their needs and targeted learning outcomes, an increase in students' learning achievement will also occur (Cobb, 2010).

IV. CONCLUSIONS

Based on the study's finding, differentiated mathematical instruction as used in teaching with varied and differentiated learning materials and activities closes the learning gaps of the Grades 3 & 4 pupils as it was revealed a significant difference in the performance before and after the implementation of the intervention. This teaching approach allows teachers to tailor their instruction to meet the individual needs of each pupil, considering their unique learning styles and abilities. Through the implementation of differentiated mathematical instructions, the performance of the pupils improved in terms of proficiency and self-assurance. This is likely since Grades 3 & 4 pupils were able to receive instruction that was specifically targeted to their learning needs and styles, allowing them to engage more fully with the material and develop a deeper understanding of the concepts being taught.

V. RECOMMENDATIONS

1. Utilize the proposed instructional supervision plan formulated.
2. The school could enhance the teaching and learning process by providing professional development training, seminars, and workshops for teachers in differentiated mathematical instruction.
3. School heads must encourage and support teachers to implement differentiated mathematical instruction frequently to improve higher order thinking skills in students, which can be achieved by exposing them to more complex problems.
4. Teachers must focus on strategies that promote knowledge acquisition and content mastery to facilitate effective teaching and learning.
5. Teachers must design activities that cover various levels of Bloom's Taxonomy, a system of thinking skills that range from lower-order to higher-order thinking.
6. Teachers can help students effectively understand the lesson's content by utilizing the differentiated mathematical instruction.
7. Teachers must consider the physical and psychological factors to create optimal learning conditions.
8. Teachers must create a versatile classroom layout with different seating arrangements incorporated to support individual and group work.
9. Teachers must also use effective classroom discipline techniques that promote a positive and safe learning environment from a psychological standpoint, and
10. Future researchers should replicate this study to include different locales and include different variables aside from the mentioned in this study.

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