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Differentiated Instruction and Mathematics Achievement of Grade 3 Learners

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Abstract

The effects of differentiated instruction on the mathematics achievement of Grade 3 pupils at Casugad Elementary School, Bula, Camarines Sur, for the school year 2023–2024 were examined using a descriptive-correlational research design. Grade 3 learners, their parents, and mathematics teachers participated in the study, with data gathered through a teacher-made test. Findings indicated that differentiated instruction was highly utilized, meaning teachers implemented various instructional strategies tailored to learners' needs. However, despite this high level of utilization, learners' mathematics achievement remained at the below basic level, suggesting that additional instructional support may be required to improve learning outcomes. The greatest impact of differentiated instruction was observed in Statistics and Probability, where learners demonstrated better comprehension and problem-solving skills. Conversely, its weakest effect was noted in Measurement, highlighting the need for improved instructional methods in this area. Statistical analysis revealed a very weak correlation between the level of utilization of differentiated instruction and overall mathematics achievement, emphasizing the need for further refinements in instructional approaches to enhance student learning.

Keywords: differentiated instruction, mathematics achievement,instructional strategies, learning outcomes

Introduction

Mathematics is an important subject that helps students develop problem-solving, logical thinking, and analytical skills. It is essential not only in school but also in daily life. Because of its importance, teachers must explore new and effective ways to teach mathematics and help students develop a positive attitude toward the subject.

Learning mathematics helps students prepare for the challenges of the modern world. Engaging in math-related activities improves their thinking skills and allows them to apply math concepts in real-life situations. To help students succeed, teachers need to use effective teaching methods. These methods should consider factors such as teacher training, available learning materials, and students' different learning abilities. A good teaching strategy encourages students to participate, think critically, and learn from each other.

One teaching approach that has gained attention is differentiated instruction. This method involves changing lesson delivery, activities, and assessments to meet the different needs of students. Since students learn in different ways and at different paces, teachers must adjust their teaching to ensure that everyone understands the lessons. Differentiated instruction allows students to work in groups, receive extra support when needed, and get feedback tailored to their progress. This approach creates an inclusive classroom where all students have a chance to succeed.

The Department of Education's K–12 mathematics curriculum aims to develop students' thinking and problem-solving skills. Differentiated instruction supports this goal by helping students grasp math concepts in ways that suit their learning styles. It also aligns with the United Nations' Sustainable Development Goal 4 (SDG 4), which promotes inclusive and high-quality education for all. SDG 4 emphasizes the importance of ensuring that students develop basic literacy and numeracy skills, especially those who struggle with learning.

However, applying differentiated instruction in classrooms is not always easy. Teachers often face challenges such as limited resources, lack of time, and insufficient training. These difficulties sometimes force teachers to use a one-size-fits-all approach, which may not work for

all students. This can lead to some students struggling while others do not feel challenged enough, making it harder for them to reach their full potential in mathematics.

At Casugad Elementary School, teachers believe that differentiated instruction can improve students' math performance. However, there is a need for proper evaluation to provide evidence of its effectiveness. Math performance in the school and the district has been a concern for years, pushing teachers to look for better ways to teach. The Albay Numeracy Assessment Tool (ALNAT) Pre-Test District Report shows that Grade 3 students have different levels of math skills, with many needing extra support to strengthen their basic knowledge. This difference in skills highlights the need for teaching methods that address individual learning needs.

To address these issues, the Department of Education introduced DepEd Order No. 42, s. 2017, requiring all public schools to use differentiated instruction. This policy aims to make education more inclusive by ensuring that teaching strategies meet the different learning styles and abilities of students. Teachers are encouraged to create lesson plans that use a variety of teaching methods and assessment techniques to help students learn at their own pace.

Grade 3 students often find mathematics challenging because some concepts are abstract and require strong thinking skills. Activities such as solving problems, explaining answers, and making logical arguments require a level of reasoning that young learners are still developing. The differences in students' prior knowledge and learning styles make teaching math even more complex.

Understanding these challenges, the researcher, as a mathematics teacher, believes that differentiated instruction can help improve students' math skills. By adapting lessons to fit individual learning needs, teachers can create an engaging and supportive classroom where students gain confidence and perform better in mathematics. This study aims to examine the effect of differentiated instruction on the math achievement of Grade 3 students at Casugad Elementary School, Bula District, Division of Camarines Sur, for the school year 2023–2024.

Differentiated Instruction in Mathematics

Differentiated instruction is widely recognized as an effective approach to addressing the diverse learning needs of students, particularly in mixed-ability classrooms. Research suggests that implementing differentiated strategies in mathematics education enhances student learning and promotes equity.

Studies emphasize that differentiated instruction, including collaborative learning and writing activities, significantly improves students' mathematical understanding and academic performance (Raquid & Litao, 2023; Peteros & Peteros, 2020). Writing-based interventions allow students to articulate their thought processes, identify errors, and deepen conceptual comprehension. Given the challenges posed by the pandemic and the Philippines' low international assessment scores, there is an urgent need for innovative strategies to support student learning.

Experimental research supports the effectiveness of differentiated instruction. Studies by Lawani (2020) and Aguayo et al. (2023) demonstrated that students exposed to differentiated teaching strategies outperformed those receiving traditional instruction. These findings highlight the impact of tailored learning approaches on mathematical proficiency and confidence.

Furthermore, differentiated instruction fosters inclusive learning environments by catering to students' readiness levels, interests, and learning styles (Chamberlin & Powers, 2020; Marlowe & Page, 2017). Formative assessments help teachers identify prior knowledge and misconceptions, enabling personalized instruction that bridges learning gaps (Moss & Brookhart, 2019). This method ensures continuous academic progress and supports diverse learning needs.

Although differentiated instruction is widely advocated, challenges persist in its implementation. Research by Bosier (2017) and Fleischman (2016) noted that time constraints, resource limitations, and the need for professional development hinder its consistent application. Administrative support and teacher training are crucial to maximizing its benefits.

Despite some studies showing no statistically significant effects on math achievement (Gamble, 2016; Maxey, 2016), a positive correlation exists between differentiation and student

performance. The effectiveness of differentiated instruction depends on implementation quality, teacher expertise, and student demographics.

Additionally, the role of language in mathematics instruction remains a subject of debate. While Bernardo (2015) found no significant difference between using Filipino or English, ongoing discussions highlight the need for further research into language's impact on math comprehension.

Overall, research underscores the transformative potential of differentiated instruction in mathematics. Effective implementation through flexible grouping, technology integration, and continuous assessment enhances student engagement and achievement (Sousa et al., 2016; Rock et al., 2018). Moving forward, sustained efforts in teacher training, curriculum development, and instructional innovation will be essential in maximizing its impact on diverse learners.

Achievement in Mathematics

Differentiated instruction has been widely recognized as an effective approach in addressing diverse student needs, particularly in mathematics education. Various studies highlight its role in improving student engagement, academic performance, and overall learning experiences. The increasing diversity in classrooms, exacerbated by learning gaps due to the pandemic, further underscores the need for tailored instructional strategies.

Pentang et al. (2020) emphasized that differentiated instruction serves as a vital intervention to bridge gaps in mathematical performance. They found that schools could retain effective instructional practices while continuing to innovate and enhance strategies to ensure student success. Similarly, Azucena (2022) highlighted how the pandemic widened learning gaps, particularly in mathematics, necessitating interventions that support students in recalling and applying mathematical concepts. Torres (2021) added that organizing differentiated lessons from basic to advanced competencies ensures a solid foundational understanding, preventing future difficulties in mastering more complex concepts.

According to Sadak (2021), mathematics educators must design lessons that allow for flexibility and revision, enabling them to create innovative learning experiences. Lai (2020) conducted a longitudinal study demonstrating that differentiated instruction significantly improves mathematical achievement by tailoring strategies to individual learning needs. This supports the argument that differentiation fosters better engagement and understanding, making it an essential approach in mathematics education.

Furthermore, Ghazalia (2019) stressed the importance of connecting procedural and conceptual understanding through differentiated instruction. Providing varied learning opportunities allows students to grasp mathematical concepts more effectively. Eckert (2018) pointed out that the increasing academic diversity in classrooms necessitates differentiated strategies to address the needs of special education students, English language learners, and those struggling with core competencies.

Gujjar (2017) demonstrated that students in small group instruction settings performed better in mathematics compared to those in whole-group instruction. He argued that flexible grouping and ongoing assessment are crucial to ensuring effective differentiation. Similarly, Tan (2016) found that differentiated instruction positively influences students' attitudes toward learning, increasing engagement and achievement while addressing difficulties in mathematical problem-solving.

Magayon (2016) noted that differentiation practices significantly impact student outcomes by allowing them to engage with materials suited to their learning preferences. Valiandes (2015) further supported this by demonstrating that students exposed to differentiated instruction showed greater learning progress than those receiving traditional instruction. He argued that effective differentiation leads to academic growth, particularly in diverse classrooms.

Grimes (2019) emphasized that differentiated instruction ensures student success by meeting individual readiness levels, thereby catering to both struggling learners and high achievers. Similarly, Tsao (2015) found that real-life applications, such as "Mathematics Trails," help contextualize learning but must be continually assessed and refined to maximize effectiveness. Mulder (2015) highlighted the need for further research on how differentiation directly impacts student learning outcomes, emphasizing that while its benefits are widely assumed, concrete evidence remains limited.

Ru Wu (2015) observed that despite carefully designed instructional methods, some students continued to struggle, demonstrating the necessity for ongoing evaluation and adaptation of differentiated strategies. Clark (2017) supported this notion, noting that the effectiveness of differentiation varies across different schools due to factors such as teacher expertise, resource availability, and student demographics.

Koeze (2017) found that differentiated instruction significantly improves student achievement and recommended that teachers conduct learning style inventories to tailor lessons effectively. Pierce (2015) similarly argued that differentiation positively influences classroom dynamics and student performance by addressing individual learning needs. Tieso (2015) suggested that authentic and meaningful curricula foster engagement and motivation, leading to better learning outcomes.

Brown (2014) asserted that differentiation is particularly important for students struggling with grade-level mathematics. He emphasized the need for scaffolding and curricular adaptations to support these learners. Biswas (2015) reiterated that factors such as study habits and attitudes significantly influence mathematical performance.

Finally, Kunter (2015) identified three key variables affecting student success in mathematics: intelligence and cognitive entry skills, quality of instruction, and affective characteristics. He emphasized the importance of addressing these factors through differentiated strategies to enhance student learning outcomes.

Methodology

This descriptive-correlational study examined the impact of differentiated instruction on the mathematics achievement of Grade 3 learners at Casugad Elementary School, Bula District, Division of Camarines Sur, during the 2023-2024 school year. A total of 102 respondents, including three teachers and 99 learners/parents, participated. Data were collected using a validated questionnaire, a teacher-made test, and an evaluation checklist, assessing lesson

delivery, learner activities, and assessment practices. The 25-item test measured performance in Number and Number Sense, Patterns and Algebra, Measurement, and Statistics and Probability. Following a structured data collection process, statistical tools such as mean, weighted mean, proficiency level, standard deviation, Pearson Product-Moment Correlation Coefficient, and Coefficient of Determination were applied to analyze the extent of differentiated instruction and its correlation with students' mathematics achievement.

Results and Discussion

Table 2A presents the level of utilization of differentiated instruction by teachers during lesson delivery in math. The highest-rated strategy is allowing students to learn at their own pace (3.76), followed by using hands-on tools (3.66) and visual images (3.54). Storytelling (3.53) and asking students to explain their ideas (3.52) are also highly utilized. The average weighted mean of 3.61 indicates a high utilization (HU) of differentiated instruction strategies. These findings align with Chamberlin et al. (2020) and Marlowe et al. (2017), emphasizing that adapting teaching strategies to students' needs enhances learning outcomes. This suggests that differentiated instruction effectively supports student engagement and comprehension in math.

Table 2B presents the level of utilization of differentiated instruction in learners' activities, with pen-and-paper tasks ranking highest (3.75), followed by board work (3.70) and realia (3.60). Games (3.44) and groupings (3.38) are also utilized, resulting in an overall high utilization (HU) with an average weighted mean of 3.58. These findings align with Aguhayon (2023), who emphasized the effectiveness of differentiated instruction in engaging students. Bernardo (2015) also highlighted the importance of varied instructional approaches in addressing diverse learning needs, while Sadak (2021) found that differentiated strategies enhance academic performance and peer collaboration. This suggests that incorporating diverse activities fosters better student engagement and learning outcomes.

Table 2C presents the level of utilization of differentiated instruction in assessment, with developing problem-solving skills (3.63) ranking highest and learning to use mathematical language effectively (3.48) ranking lowest. The high rating for problem-solving skills suggests that teachers emphasize real-life applications of math, helping students develop critical thinking abilities. However, the lower rating for mathematical language use implies a need for stronger integration of precise math communication in assessments. With an overall high utilization

(3.56), these findings align with Torres (2021), Muthomi (2014), and Eckert (2018), highlighting the importance of differentiated assessments in engaging students, accommodating diverse learning styles, and fostering mastery of mathematical concepts.

Table 3 presents the mathematics achievement of Grade 3 learners after using differentiated instruction, showing the highest performance in Measurement (Mean = 2.70, PL = 89.90, VS) and the lowest in Number and Number Sense (Mean = 8.02, PL = 50.13, DME). The overall performance level (PL = 62.69, DME) indicates that while differentiated instruction supports learning, there are still gaps, particularly in fundamental areas like number sense and algebra. These findings suggest the need for more targeted interventions, such as reinforcing basic mathematical concepts and improving instructional strategies to enhance understanding and retention. Strengthening differentiated approaches in weaker areas could lead to improved overall mathematics achievement.

Table 4 examines the relationship between the level of utilization of differentiated instruction and mathematics achievement, revealing a significant negative correlation across all aspects. The strongest relationship is observed between assessment and statistics and probability (r = -0.716, HC), while the weakest is between lesson delivery and measurement (r = -0.396, LC). The negative correlations suggest that as differentiated instruction increases, student performance does not necessarily improve, possibly due to ineffective implementation, student adjustment challenges, or gaps in instructional strategies. These findings highlight the need for refining differentiated approaches, ensuring they are effectively tailored to students' needs, and continuously assessing their impact to enhance mathematics achievement.

Table 5 presents the influence of differentiated instruction on mathematics achievement, with the highest influence observed in assessment on statistics and probability (51.3%, M) and the lowest in learners' activities on measurement (11.8%, VL). The strong influence on statistics and probability aligns with Ghazallia (2019), who emphasized that differentiated instruction is most effective in complex subjects requiring critical thinking. Conversely, the very low influence on measurement suggests that foundational skills may require different instructional approaches, as noted by Valiandes (2015). These findings indicate that while differentiated instruction enhances higher-order thinking skills, more targeted strategies are needed for basic mathematical concepts to maximize its effectiveness across all learning areas.

Table 2A. Level of Utilization of the Differentiate Instruction Used by the Teachers Along Lesson Delivery

Indicators	Wm	Int	Rank
Gives learners the opportunity to learn new math ideas at their own pace without feeling rushed.	3.76	HU	1
Uses hands-on tools that make math a lot easier for young children to understand.	3.66	HU	2
Uses visual images like pictures, graphs, map, and real objects in teaching.	3.54	HU	3
Incorporates storytelling in math lessons to make connections to real-world scenarios.	3.53	HU	4
Asks the learners to explain their ideas.	3.52	HU	5
Average Weighted Mean	**3.61**	**HU**	

Table 2B. Level of Utilization of the Differentiated Instruction Used by the Teachers Along Learners' Activities

Indicators	Wm	Int	Rank
Pen and Paper	3.75	HU	1
Board work	3.70	HU	2
Realia	3.60	HU	3
Games	3.44	HU	4
Groupings	3.38	HU	5
Average Weighted Mean	**3.58**	**HU**	

Table 2C. Level of Utilization of the Differentiated Instruction Used by the Teachers Along Assessment

Indicators	Wm	Int	Rank
Develops problem solving skills and the ability to use mathematics in everyday life.	3.63	HU	1
Demonstrates understanding and appreciation of key concepts and skills involving numbers and number sense.	3.62	HU	2
Develops positive attitude toward mathematics and to appreciate its practical applications in life.	3.55	HU	3
Becomes proficient in fundamental mathematical skills and in recalling basic number facts.	3.49	HU	4
Learns to use mathematical language effectively and accurately.	3.48	HU	5
Average Weighted Mean	**3.56**	**HU**	

Table 3. Level of Mathematics Achievement of Grade 3 Learners in Mathematics After Using Differentiated Instruction

Aspects	No. of	Mean Score	SD	PL	Int.	Rank
Measurement	3	2.70	0.54	89.90	VS	1
Statistics and Probability	6	3.33	1.47	55.56	DME	2
Pattern and Algebra	10	5.52	2.76	55.15	DME	3
Number and Number	16	8.02	2.85	50.13	DME	4
Average		**4.89**		**62.69**	**DME**	

Table 4. Significant Relationship Between Level of Utilization of Differentiated Instruction and Mathematics Achievement

Level of Validation	Mathematics Achievements	r-value	Int.	p-value	Int.
Lesson Delivery	Number and Number sense	-0.550	MC	0.000	S
	Pattern and Algebra	-0.590	MC	0.000	S
	Measurement	-0.396	LC	0.000	S
	Statistics and Probability	-0.670	MC	0.000	S
Learners' Activities	Number and Number sense	-0.622	MC	0.000	S
	Pattern and Algebra	-0.653	MC	0.000	S
	Measurement	-0.344	LC	0.000	S
	Statistics and Probability	-0.689	MC	0.000	S
Assessment	Number and Number sense	-0.637	MC	0.000	S
	Pattern and Algebra	-0.675	MC	0.000	S
	Measurement	-0.393	LC	0.000	S
	Statistics and Probability	-0.716	HC	0.000	S

Table 5. Significant Influence of the Utilization of Differentiated Instruction on Mathematics Achievement

Level of Validation	Mathematics Achievements	%	Int.
Lesson Delivery	Number and Number sense	30.3%	L
	Pattern and Algebra	34.8%	L
	Measurement	15.7%	VL
	Statistics and Probability	44.9%	M
Learners' Activities	Number and Number sense	38.7%	L
	Pattern and Algebra	42.6%	M
	Measurement	11.8%	VL
	Statistics and Probability	47.5%	M
Assessment	Number and Number sense	40.6%	M
	Pattern and Algebra	45.6%	M
	Measurement	15.4%	VL
	Statistics and Probability	51.3%	M

Conclusions

As a whole, the utilization of differentiated instruction by teachers was highly implemented. However, Grade 3 learners remained in the below-basic category in mathematics achievement. Differentiated instruction showed a moderate influence on learners' performance in Statistics and Probability, while its impact on Measurement was predominantly very low. Furthermore, the overall level of utilization of differentiated instruction exhibited a very weak influence on students' mathematics achievement. These findings indicate that while differentiated instruction was applied, its effect on improving mathematics performance varied across different areas of the subject.

Recommendations

The study recommends that support of the school Principal is necessary for an in-school training and demonstration on the incorporation of Intellectual Authority in teaching Mathematics not only in Grade 3 but in all grade levels. If warranted, the training can be made throughout the Division of Camarines Sur. Further development of the attitudes of students towards Mathematics should be done by teachers to insure a better result in the teaching-learning process. Other correlates may be used in mathematics like personality traits of students' interest inventory and learning styles. In this way, students' learning can be better addressed, and that the participation of the guidance counselor can also be tapped to improve student performance.

In addition, further study may be done on the use of Intellectual Authority expanding it to two or three quarters or using it in a different method like the cross-over or change over design so that learners in the control or comparison group may also experience the treatment given in the experimental group. This will validate the present finding that performance of the students increases when Intellectual Authority is used as a strategy. Furthermore, since the duration of the experiment was only one quarter of the school year, the same set of attitudes may still be used when the study is conducted on a longer period. This may prove or disprove that there is no

difference between attitude before and after using Intellectual Authority as a strategy in teaching the discipline.

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