International Journal of Sustainability and Advanced Integrated Research
Volume 2, Issue 2 (April-June 2026) | ISSN: 3107-7854
DOI: https://doi.org/10.65339/ijsair.V2.I2.166

Effectiveness of Differentiated Instruction in Teaching Mathematics for Grade Three Pupils

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Publication history: Received: March 12, 2026; Revised: March 29, 2026; Accepted: April 3, 2026
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Abstract

This study examined the effectiveness of differentiated instruction in teaching Mathematics among Grade Three pupils at Baras Elementary School during the School Year 2025–2026. The research employed an experimental design, specifically a single-group pretest–posttest approach, involving thirty (30) Grade Three pupils. The respondents were described in terms of sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation, and monthly family income. A researcher-made test was utilized to measure pupils' performance before and after the implementation of differentiated instruction.Findings revealed that most of the pupils were male, first-born, belonging to families with two children, and had parents who were college graduates employed in government positions with a monthly income of ₱20,000 and above. In terms of Mathematics performance, pupils initially obtained a rating of "Did Not Meet Expectations" in the pretest, particularly in competencies such as understanding and visualization of measurement conversion, application in problem solving, representation of measures, and integration across measurement types. However, after exposure to differentiated instruction, their performance significantly improved to a "Very Satisfactory" level in the posttest results. Statistical analysis showed a significant difference between pretest and posttest scores, indicating the effectiveness of differentiated instruction.Further analysis revealed that no significant differences existed in pupils' posttest performance when grouped according to sex, sibling position, parents' educational attainment, parents' occupation, and monthly family income. However, a significant difference was observed when pupils were grouped according to the number of children in the family, suggesting its influence on learning outcomes.The study concluded that differentiated instruction is effective in improving pupils' Mathematics performance. It is recommended that teachers continue implementing differentiated strategies, while school administrators provide continuous professional development and monitoring to sustain instructional effectiveness. Further studies may be conducted to explore additional variables affecting the impact of differentiated instruction.

Keywords: Differentiated Instruction, Mathematics Education, Grade Three Pupils, Experimental Research, Academic Performance, Measurement Skills, Teaching Strategies, Elementary Education.

1. Introduction

Education is widely recognized as a fundamental pillar of national development and an essential process in shaping individuals' knowledge, skills, attitudes, and values necessary for active participation in society. It promotes critical thinking, creativity, and adaptability while fostering social cohesion and inclusivity. In the Philippines, the importance of education is enshrined in Article XIV, Section 1 of the 1987 Constitution, which mandates the State to protect and promote the right of all citizens to quality education that is accessible to all. This constitutional provision underscores the government's commitment to ensuring equitable and effective educational opportunities across all levels. Aligned with this mandate, the Department of Education continues to implement programs aimed at improving learners' competencies, particularly in foundational subjects such as Mathematics. However, despite these efforts, many learners still encounter challenges in developing essential mathematical skills. Research indicates that students often struggle with abstract concepts, problem-solving, and conceptual understanding, which are further exacerbated by diverse learner characteristics such as differences in readiness, learning styles, and socio-economic backgrounds.

Several studies have highlighted the effectiveness of differentiated instruction in improving student learning outcomes. International studies by Chen and Jang (2024) revealed that differentiated instruction significantly enhances students' mathematical achievement, problem-solving skills, and engagement compared to traditional teaching methods. Similarly, the systematic review of Maryani et al. (2025) emphasized that differentiated instruction improves understanding and supports diverse learners, while recognizing the global application of such strategies. Further, the study of Maphumulo et al. (2025) demonstrated that teachers' implementation of differentiated strategies, such as peer tutoring and individualized instruction, plays a crucial role in improving learning outcomes. In addition, Trisnani et al. (2025) noted that while differentiated instruction is effective, its implementation is often constrained by limited resources and

institutional support. Meanwhile, Hayden et al. (2023) highlighted that although teachers gain better understanding through differentiated curricula, challenges such as time constraints remain. Local studies also support these findings. Insorio (2024) found that differentiated instruction significantly improves students' engagement and mathematical performance. Likewise, Manuel and Mempin (2025) emphasized that tailored instruction enhances academic performance, critical thinking, and engagement, though challenges such as large class sizes persist. Studies by Salazar and Gumanoy (2025) further confirmed that differentiated instruction leads to greater improvements in achievement and motivation compared to traditional methods. Similarly, Cabeserano (2025) demonstrated significant gains in mathematics performance through differentiated strategies.

Despite the abundance of studies on differentiated instruction, several gaps remain evident. First, many existing studies focus on higher-grade levels, secondary education, or tertiary learners, leaving a limited number of studies concentrating on early grade levels, particularly Grade Three pupils. Second, most local studies emphasize general mathematics performance or broader competencies, with limited focus on specific domains such as measurement conversion and visualization. Third, while numerous studies highlight the effectiveness of differentiated instruction, fewer employ experimental pretest–posttest designs to directly measure learning gains in a controlled manner. Moreover, existing research often focuses on teacher perspectives, implementation challenges, or general outcomes, rather than examining the specific impact of differentiated instruction on pupil performance in a localized school context. There is also limited exploration of how learner demographic profiles, such as family background, influence learning outcomes in relation to differentiated instruction. In response to these gaps, the present study aims to determine the effectiveness of differentiated instruction in teaching Mathematics among Grade Three pupils at Baras Elementary School. Specifically, it seeks to provide empirical evidence on its impact on pupils' performance, particularly in measurement-related competencies, and to contribute to the growing body of literature supporting inclusive and learner-centered instructional practices.

2. Material and methods

2.1 Research Design

The efficiency of differentiated instruction in teaching mathematics to third-graders was examined in the current study using an experimental research methodology.

2.2 Locale of the Study

The study was conducted in Baras Elementary School. This is one of the public elementary schools in the Baras District, Division of Rizal. This school offers complete elementary education from kindergarten to grade six.

2.3 Respondents of the Study

The study considered 30 grade three pupils in Baras Elementary School. They were described in terms of sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation and monthly family income.

2.4 Sample and Sampling Procedure

The study employed a purposive sampling technique in selecting the thirty (30) Grade Three pupils from Baras Elementary School as respondents, as they were the most accessible group and appropriate for examining the effectiveness of differentiated instruction in Mathematics. All selected pupils were included to ensure a complete representation of the class, and they were described in terms of sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation, and monthly family income to provide a comprehensive profile of the learners.

2.5 Research Instrument

The study utilized a researcher-made Mathematics achievement test as the primary instrument for data collection, consisting of two parts: Part I gathered the respondents' personal and socio-economic profiles, while Part II comprised a 40-item test covering competencies in measurement conversion, problem-solving, representation, and integration across measures, administered as both pretest and posttest. The results were interpreted using a standardized scale ranging from "Did Not Meet Expectations" to "Outstanding." During the pretest, students' prior knowledge and skills were assessed, while the instructional phase employed differentiated strategies tailored to learners' diverse needs and learning styles, followed by a posttest to measure learning gains and the effectiveness of the intervention. The instrument underwent content validation through experts, including mathematics teachers, research advisers, statisticians, and academic officials, who reviewed and refined the test items. It was further validated through a try-out with 33 pupils at Baras Elementary School, where item analysis was conducted to determine difficulty levels. Reliability was established using the split-half method, with Pearson-product moment correlation and Spearman-Brown formula yielding high reliability coefficients of .86 and .89, indicating that the instrument was valid and reliable for measuring students' Mathematics performance.

2.6 Data Gathering Procedure

The study followed the Gantt Chart of Activities in conducting the research, covering the formulation of the research problem through the revision of the manuscript and submission of the final copy. The instrument was content-validated by the experts, then, permission to conduct the study was secured from the Office of the Schools Division Superintendent. Afterwards, the researcher-made test was administered to 3 grade three pupils not included in the study. The test papers were collated, scored and subjected to reliability test. The researcher-made test was administered to the respondents as a pretest. Subsequently, the grade three pupils were exposed to differentiated instruction in Mathematics. Upon completion of the instructional intervention, the posttest was administered. The data obtained follows the Data Privacy Act. On the retrieval, the data was encoded for submission to the statistician. The data was processed using Statistical Package for Social Sciences (SPSS). Afterwards, tabulation, analysis and interpretation of data followed.Summary of findings, conclusions and recommendations were formulated. The presentation of the study was scheduled. At the time of the final oral defense, the researcher presented the thesis to the Oral Examination Committee. The manuscript was subjected to anti-plagiarism test at the statistical center. After the oral defense, the manuscript was revised based on the comments and suggestions of the oral examination committee. Following the revisions, the manuscript was reproduced and prepared for bookbinding. Finally, hardbound copies were submitted to the Office of the Dean of the Graduate Studies Program and other offices concerned.

2.7 Data Analysis Techniques

For the statistical treatment of data, various tools were employed to analyze and interpret the findings of the study. Frequency, percentage, and rank distribution were used to describe the profile of the respondents in terms of selected variables. The mean and standard deviation were utilized to determine the level of performance of Grade Three pupils before and after exposure to differentiated instruction in Mathematics, particularly based on their pretest and posttest scores across different competencies. To test the significant difference in pupils' performance after the intervention, a dependent t-test was applied to compare the pretest and posttest results. Furthermore, a one-way analysis of variance (ANOVA) was used to examine whether there were significant differences in the pupils' performance in relation to their profile variables based on the posttest results.

2.8 Ethical Considerations

This study strictly adhered to ethical standards in the conduct of research. Prior to data collection, permission was sought from the school authorities and concerned officials to ensure proper coordination and approval. The respondents were informed about the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained, assuring them that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the respondents were strictly maintained by not disclosing their identities and ensuring that all collected data were used solely for academic purposes. Additionally, the researcher ensured that no harm, discomfort, or bias would affect the participants throughout the process. All information gathered was treated with utmost respect and integrity, and results were presented honestly and objectively.

3. Results and Discussion

3.1 Profile of the Respondents in Terms of the Selected Variables

The table presents the profile of the respondents in terms of sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation, and monthly family income. Results show that most of the pupils are male (56.7%) compared to female (43.3%), with the majority being first-born children (40.0%), while the least are fifth-born (3.3%). In terms of family size, most pupils come from families with two children (30.0%), while a smaller percentage belong to families with five or more children (10.0%). Regarding parents' educational attainment, both fathers and mothers are largely college graduates, with mothers having a higher percentage (70.0%) compared to fathers (50.0%). In terms of occupation, most fathers are government employees (23.3%), while mothers are also predominantly government employees (40.0%), followed by private company employees and housewives. Lastly, in terms of monthly family income, the majority of families earn ₱20,000 and above (63.3%), indicating that most respondents belong to relatively higher-income households, while only a small percentage fall within the lowest income bracket of ₱5,000–₱9,999 (3.3%).

Table 1
Profile of the Respondents in Terms of Selected Variables

Sex	**f**	**%**	**R**
Male	17	56.7	1
Female	13	43.3	2
Total	**30**	**100.0**	
Sibling Position	**f**	**%**	**R**
First	12	40.0	1
Second	10	33.3	2
Third	3	10.0	4
Fourth	4	13.3	3
Fifth	1	3.3	5
Total	**30**	**100.0**	
Number of Children in the Family	**f**	**%**	**R**
1	5	16.7	4
2	9	30.0	1
3	7	23.3	2
4	6	20.0	3
5 and above	3	10.0	5
Total	**30**	**100.0**	

	Father			**Mother**		
Parents' Educational Attainment	**f**	**%**	**R**	**F**	**%**	**R**
College Graduate	15	50.0	1	21	70.0	1
Tech-Voc Graduate	2	6.7	4	2	6.7	3.5
College Undergraduate	6	20.0	2	2	6.7	3.5
High School Graduate	5	16.7	3	4	13.3	2
High School Undergraduate	-	-		1	3.3	5
No Answer (Single Parent)	2	6.7	5	-	-	
Total	**30**	**100.0**		**30**	**100.0**	

	Father			**Mother**		
Parents' Occupation	**f**	**%**	**R**	**F**	**%**	**R**
Government Employee	7	23.3	1	12	40.0	1
Private Company Employee	4	13.3	3.5	5	16.7	2.5
Self Employed	3	10.0	5	4	13.3	4
OFW	4	13.3	3.5	2	6.7	5
Househusband/housewife	1	3.3	8	5	16.7	2.5
Vendor	2	6.7	6	1	3.3	6.5
House helper	1	3.3	8	1	3.3	6.5
Construction work	5	16.7	2	-	-	
Driver	1	3.3	8	-	-	
Total	**30**	**100.0**		**30**	**100.0**	

Monthly Family Income	**f**	**%**	**R**
₱20,000 and above	19	63.3	1
₱15,000 –₱19,999	4	13.3	3
₱10,000- ₱14,999	6	20.0	2
₱5,000-₱9,999	1	3.3	4
Total	**30**	**100.0**	

3.2 Level of Performance of Grade Three Pupils Before and After Exposure to Differentiated Instruction in Teaching Mathematics as Reflected in Their Pretest and Posttest Results in Terms of Understanding and Visualization of Measurement Conversion, Application in Problem Solving, Representation of Various Measures, and Integration Across Different Measurement Concepts

The table reflects the overall performance of Grade Three pupils in terms of understanding and visualization of measurement conversion, application in problem solving, representation of different measures, and integration across measurement types before and after exposure to differentiated instruction in Mathematics. The results of the pretest show that all 30 pupils initially performed at a very low level, with scores ranging from 8 to 17, which fall under the "Did Not Meet Expectations" category, yielding a mean score of 12.00 and a Mean Percentage Score (MPS) of 30.00, indicating limited prior knowledge and difficulty in grasping measurement concepts. In contrast, the posttest results reveal a substantial improvement, with the majority of pupils (93%) attaining "Outstanding" performance, followed by 27% at "Very Satisfactory," 20% at "Satisfactory," and 13% at "Fairly Satisfactory," with no pupils remaining in the lowest category; the highest score reached 40 and the lowest was 24, while the mean increased significantly to 33.53 with an MPS of 83.83, reflecting a marked enhancement in overall performance across all competencies. The increase in standard deviation from 2.38 in the pretest to 3.99 in the posttest suggests that while pupils collectively improved, their individual rates of progress varied due to the differentiated activities that catered to diverse learning needs. These findings clearly indicate a significant difference in pupils' performance before and after the implementation of differentiated instruction, demonstrating that when teaching strategies are aligned with learners' readiness, interests, and learning profiles, pupils develop stronger conceptual understanding, improved problem-solving skills, and better ability to integrate and apply mathematical concepts. This supports the findings of Maryani et al., which emphasize that differentiated instruction enhances academic achievement, motivation, and engagement, ultimately leading to improved learning outcomes in Mathematics.

Table 2
Level of Performance of Grade Three Pupils Before and After Exposure to Differentiated Instruction in Teaching Mathematics as Reflected In Their Pretest and Posttest Across Various Competencies

Score	Verbal Interpretation	Total Pretest		Total Posttest	
		f	%	F	%
36 - 40	Outstanding	1	3	28	93
32 – 35	Very Satisfactory	4	13	8	27
28 – 31	Satisfactory	10	33	6	20
24 – 27	Fairly Satisfactory	14	47	4	13
0 - 23	Did Not Meet Expectations	1	3	-	-
Total		**30**	**100**	**30**	**100**
Highest Score		**17**		**40**	
Lowest Score		**8**		**24**	
Mean		**12.00 - Did Not Meet Expectations**		**33.53 - Very Satisfactory**	
Mean Percentage Score (MPS)		**30.00**		**83.83**	
Std. Deviation		**2.38**		**3.99**	

3.3 Significant Difference on the Level of Performance of the Grade Three Pupils After Exposure to Differentiated Instruction in Teaching Mathematics as Reflected in the Pretest and Posttest Results Across Various Competencies

The table presents the results of the t-test analysis comparing the performance of Grade Three pupils before and after the implementation of differentiated instruction in Mathematics across various competencies, namely understanding and visualization of measurement conversion, application in problem solving, representation of different measures, and integration across measurement types. The findings reveal that all computed p-values are less than the .05 level of significance, leading to the rejection of the null hypothesis, which indicates that there is a statistically significant difference between the pretest and posttest scores of the pupils. Specifically, the t-values for the different competencies are notably high and negative (e.g., -10.322, -21.650, -9.278, and -19.830), reflecting substantial improvements in posttest scores compared to pretest scores. The mean scores also show a marked increase across all competencies, with understanding and visualization rising from 5.30 to 7.90, application in problem solving from 0.53 to 13.23, representation from 3.43 to 7.90, integration from 2.77 to 7.30, and the total score from 12.00 to 33.53, indicating a significant enhancement in pupils'

overall mathematical performance. These results suggest that prior to the intervention, pupils had limited knowledge and difficulty in applying mathematical concepts, but after exposure to differentiated instruction, they demonstrated improved comprehension, better problem-solving abilities, and stronger integration of measurement concepts. The findings imply that differentiated instruction is an effective teaching strategy in addressing diverse learning needs, as it allows pupils to engage with content at their own level and pace, thereby improving their academic performance and conceptual understanding. This aligns with the findings of Cabeserano, which also reported significant gains in mathematics performance after the use of differentiated instruction, supporting the conclusion that this approach has a measurable and positive impact on student learning outcomes across multiple competencies.

Table 3
Result of the t-test in the Significant Difference on the Level of Performance of the Grade Three Pupils After Exposure to Differentiated Instruction in Teaching Mathematics as Reflected in the Pretest and Posttest Results Across Various Competencies

Competencies	Test	N	Mean	SD	t-value	p-value	Ho	Verbal Interpretation
Understanding and Visualization of Measurement Conversion	Pretest	30	5.30	1.37	-10.322	0.000	Rejected	Significant
	Posttest	30	7.90	0.40				
Application in Problem Solving	Pretest	30	0.53	0.94	-21.650	0.000	Rejected	Significant
	Posttest	30	13.23	2.86				
Representation of Different Measures	Pretest	30	3.43	1.28	-9.278	0.000	Rejected	Significant
	Posttest	30	7.90	1.56				
Integration Across Measurement Types	Pretest	30	2.77	1.07	-19.830	0.000	Rejected	Significant
	Posttest	30	7.30	0.95				
Total Score	Pretest	30	12.00	2.38	-32.184	0.000	Rejected	Significant
	Posttest	30	33.53	3.99				

3.4 Significant Difference on the Level of Performance of the Grade Three Pupils after Exposure to Differentiated Instruction in Teaching Mathematics as Reflected in the Posttest Results in Terms of Their Profile

As reflected in the table, the results of the test on the level of performance of Grade Three pupils after exposure to differentiated instruction in teaching Mathematics, as revealed in the posttest scores across different profile variables such as sex, sibling position, parents' educational attainment, parents' occupation, and monthly family income, show p-values that are higher than the .05 level of significance; hence, the null hypothesis is accepted for these variables. This indicates that there is no significant difference in the pupils' performance when grouped according to sex, sibling position, parents' educational attainment, parents' occupation, and monthly family income, suggesting that these factors do not significantly influence the effectiveness of differentiated instruction in improving Mathematics performance. In contrast, when the pupils are grouped according to the number of children in the family, the p-value obtained is lower than .05, leading to the rejection of the null hypothesis, which implies that a significant difference exists based on this variable. This finding suggests that the number of children in the family may have an impact on pupils' academic performance, possibly due to differences in the level of parental attention, guidance, and available learning resources at home, where pupils from smaller families may receive more focused support compared to those from larger families. Overall, the results imply that differentiated instruction is effective across various demographic profiles, as it accommodates diverse learning needs and provides equal opportunities for pupils to engage and succeed in the learning process regardless of their background. These findings are consistent with the study of Ferrer and Naanep, which highlights that differentiated instruction enhances students' academic outcomes irrespective of individual differences, further supporting the conclusion that this instructional approach promotes equitable and effective learning outcomes in Mathematics.

Table 4
Significant Difference on the Level of Performance of the Grade Three Pupils after Exposure to Differentiated Instruction in Teaching Mathematics as Reflected in the Posttest Results in Terms of Their Profile

Variable	F-value	p-value	Ho	Verbal Interpretation
Sex	0.546	0.466	Accepted	Not Significant
Sibling Position	1.563	0.215	Accepted	Not Significant
Number of Children in the Family	2.750	0.050	Rejected	Significant
Fathers' Educational Attainment	1.160	0.345	Accepted	Not Significant
Mothers'' Educational Attainment	0.486	0.746	Accepted	Not Significant
Fathers' Occupation.	0.712	0.679	Accepted	Not Significant
Mothers' Occupation	0.695	0.656	Accepted	Not Significant
Monthly Family Income	0.520	0.672	Accepted	Not Significant

4. Conclusion & Recommendations

Based on the findings of the study, it can be concluded that the performance of Grade Three pupils in Mathematics significantly improved after exposure to differentiated instruction, as evidenced by the notable increase in their posttest scores across all competencies, including understanding and visualization of measurement conversion, application in problem solving, representation of different measures, and integration of measurement concepts. The results also show that demographic variables such as sex, sibling position, parents' educational attainment, parents' occupation, and monthly family income do not significantly affect pupils' performance after the intervention, indicating that differentiated instruction is effective regardless of these factors. However, the number of children in the family emerged as a significant variable, suggesting that family size may influence the level of support and learning environment available to pupils, which in turn affects their academic performance in Mathematics.

In light of these findings, several recommendations are proposed to further enhance the effectiveness of differentiated instruction. School administrators are encouraged to provide continuous professional development programs to strengthen teachers' skills in implementing differentiated instructional strategies, as well as to conduct regular monitoring and evaluation of pupils' academic performance. Teachers are likewise encouraged to consistently apply differentiated instruction, design varied learning activities and assessment tasks, and provide additional support to pupils, especially those from larger families who may require more individualized assistance. Pupils are also encouraged to actively engage in learning activities and practice problem-solving tasks to deepen their understanding of mathematical concepts. Furthermore, the implementation of the proposed action plan is recommended, along with conducting further studies to explore other variables that may influence the effectiveness of differentiated instruction in teaching Mathematics.

Compliance with ethical standards

The author declares no conflict of interest. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. This study was self-funded. The authors thank the participating respondents for their contributions

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