

Effectiveness of Diverse Teaching Strategies on Academic Performance of Students in the Mathematics Intervention Program

Jericho Y. Baybayan and Twinkle Gem M. Abelarde

Notre Dame University, Philippines

DOI: <https://doi.org/10.47772/IJRISS.2026.100400293>

Received: 09 April 2026; Accepted: 14 April 2026; Published: 06 May 2026

ABSTRACT

This study investigated the effectiveness of three teaching strategies namely Differentiated Instruction, Direct Instruction, and Collaborative Learning on the academic performance of junior high school students in a Mathematics Intervention Program in a private school in Central Mindanao, Philippines. A quasi-experimental pretest–posttest design was employed involving 117 Grade 10 students, each assigned to one of the three strategies over one school quarter or six weeks. Academic performance was measured using a validated researcher-made mathematics test administered as both pretest and posttest. Descriptive statistics and paired samples t-tests were used to examine changes in mean scores within each group, while a one-way analysis of variance (ANOVA) compared academic gains across the three strategies to determine which produced the greatest improvement. Findings showed statistically significant gains for all strategies, with performance improving from Fairly Satisfactory to Satisfactory levels ($p < 0.05$). Differentiated Instruction yielded the largest mean gain, followed by Direct Instruction, with Collaborative Learning also producing positive, though comparatively smaller, gains. Anchored in Vygotsky's Sociocultural Theory and Gardner's Multiple Intelligences Theory, the study underscores the importance of responsive pedagogy in interventions and recommends prioritizing differentiated and direct instruction while incorporating collaborative activities to deepen understanding and engagement.

Keywords: Differentiated Instruction, Direct Instruction, Collaborative Learning, Mathematics Intervention Program, academic performance, junior high school, teaching strategies

INTRODUCTION

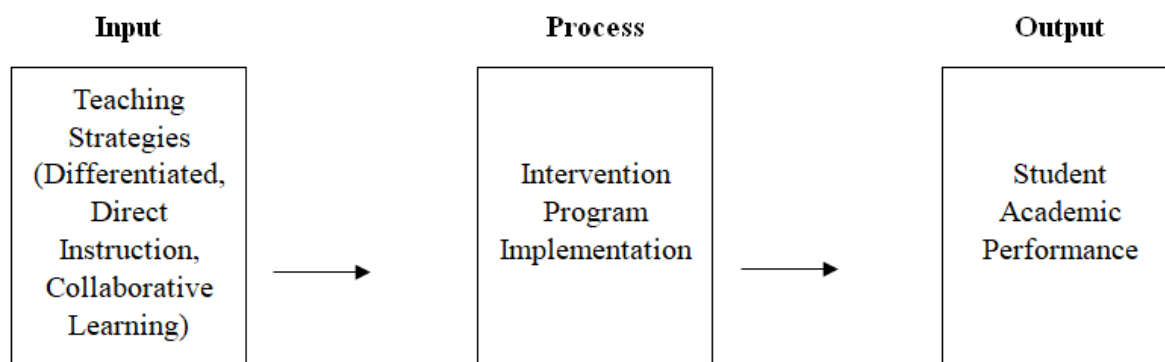
Teaching students with academic difficulties becomes challenging for educators in today's diverse classrooms especially when it comes to the subject of mathematics, which is found to be very cumulative and complex by nature. Schools have relied most on such academic intervention programs which offer supplementary teaching to students with learning deficiencies in order to compensate the widening achievement gap as a result of the COVID-19 pandemic, poor reading comprehension, and other reasons. Thus, such improvement should boost academic performance and hopefully reengage learning on material presented as inaccessible in the past. Nevertheless, a critical gap exists in the comparative effectiveness research of different pedagogies under these programs despite their wide implementations in the field, particularly in junior high school.

Intervention is more than providing extra time for instruction for it involves the right types of teaching for the unique characteristics of individual learners (Slavin, 2017). Differentiated Instruction, Direct Instruction, and Collaborative Learning are the most popular intervention strategies in use today. Each has unique theoretical underpinnings regarding how it conceives learning, instruction, or curriculum. For example, Differentiated Instruction is based on suitability of content, process, and product for the readiness, interests, and learning profile of the learner (Tomlinson, 2001). Direct Instruction is highly structured, involving teacher-led explanations, guided practice, and systematic feedback (Rosenshine, 2012). Collaborative Learning rests on a social constructivist basis, as it encourages peer interaction and joint problem-solving (Johnson & Johnson, 2009). However, there are only some studies comparing these strategies; thus, it is unknown which of the approaches can best support low-performing students in Mathematics.

This study is guided by two fundamental theories, namely Vygotsky's Sociocultural Theory about the impact of social interaction on cognitive development, and Gardner's Multiple Intelligences Theory, which proposes diverse instruction for addressing different cognitive strengths of students (Vygotsky, 1978; Gardner, 1983). These theoretical constructs were employed in the design of the study by informing the selection of the instructional strategies most suitable for the different learning modalities for different social learning contexts. Main objectives of this study have been examining the effects of such instructional strategies on students' academic performance reflected in their pretest-posttest results and assessing students' perspectives on each of the approaches. Findings would be of great importance to educators and school administrators in designing or improving intervention programs to help needy learners.

Theoretical and Conceptual Framework

This study is grounded in Vygotsky's Sociocultural Theory, which emphasizes the importance of social interaction in learning, and Gardner's Multiple Intelligences Theory, which supports tailoring instruction to diverse learner needs. The conceptual framework aligns teaching strategies with cognitive engagement and academic outcomes.



Statement of the Problem

The purpose of this study is to evaluate and compare the effectiveness of selected teaching strategies used in an academic intervention program, specifically it answers the following questions:

1. What is the pre and post intervention academic performance of students in a Mathematics Intervention Program?
2. Is there a significant difference in the pre and post intervention academic performance of students in a Mathematics Intervention Program?
3. Which of these teaching strategies results in the highest academic gains among Grade 10 students needing academic support?

REVIEW OF RELATED LITERATURE

Differentiated instruction, as defined by Tomlinson (2001), refers to the adjustment of teaching techniques according to the students' readiness, interests, and profiles of learning. It offers a suitable approach, more often needed in intervention programs due to the high diversity of academic achievements and needs among learners. Studies have proven that when instruction is well directed and individualized effectively, it leads to the students being more engaged and hence better performance in academics. At the same time, as Rosenshine (2012) emphasizes, the whole premise of Direct Instruction is clear, structured, explicit teaching practices, especially with those students who may be lagging behind in their studies. It provides a step-by-step guide, gives instant feedback, and repetitively offers scope for practice and mastery. Thus, when focusing on intervention programs, the students are required to understand a concept before they are taught more advanced ideas.

Another influential strategy espoused by Johnson and Johnson (2009) is collaborative learning, where students work in small groups to achieve common academic objectives. This strategy enhances critical thinking skills and deeper understanding together with social interaction, an important aspect of learning according to Vygotsky's Sociocultural Theory. Within the setting of an intervention, collaboration fosters cognitive development while simultaneously enhancing learners' confidence and attitudes to learning. Slavin (2017) further provides insights into how such interventions would influence learner outcomes. Effective program interventions need to be timely, focus on specific learning deficiencies, and use researched strategies. Much literature exists on various isolated teaching strategies; however, there are few comparative studies that evaluate their effectiveness within the same intervention program. This research covers this gap by investigating the effect of differentiated instruction, direct instruction, and collaborative learning strategies upon the academic performance of students in one intervention program.

METHODOLOGY

Research Design

To measure the efficacy of Mathematics Intervention Program, a quasi-experimental pretest-posttest is used. In this instance, the students taking part in the school's Intervention Program are grouped according to their teaching strategy: Differentiated Instruction, Direct Instruction, or Collaborative Learning. All have the same academic content, but through different instructional exposure.

Pretesting determined the academic standing of each participant before the strategies were applied; testing thereafter will give a measure of academic gain after each group has been exposed for several weeks to their respective teaching strategies. The design will allow for the between-group comparison according to posttest scores, with adjustment made for initial differences through pretest scores. Hence, the researcher will be in the position to state which teaching strategy is best for improving the academic performance of students in the Intervention Program. It is true that randomization was not used in this design to limit other confounding variables. Nonetheless, this design offers a feasible and ethical means of assessing instructional effectiveness in the natural classroom setting.

Setting

The study was conducted in a private Junior High school in Central Mindanao, Philippines, focusing on Grade 10 students under the Mathematics Intervention Program during the Academic Year 2025–2026.

Respondents

The respondents in this study consist of 117 Grade 10 students who are currently enrolled in a Mathematics Intervention Program in a private Junior High school in the Central Mindanao, Philippines. These students were selected based on their sections. To examine the effectiveness of different teaching strategies, the students are divided into three non-randomized groups. Group A is exposed to Differentiated Instruction, Group B to Direct Instruction, and Group C to Collaborative Learning.

Instrument

The primary data collection tool for this study was a researcher-made Mathematics test administered as both a pretest and posttest. This test is aligned with the competencies covered during the intervention and has been validated by three mathematics education experts for content validity.

Data Gathering Procedure

It is paramount to administer a pretest to familiarize all participants with the measuring tool. The students being intervened on for One Quarter which is equivalent to six weeks are taught according to the designated teaching strategy for their group. Upon the completion of the intervention, a posttest is administered to evaluate academic gain.

Data Analysis

Descriptive statistics such as the mean and standard deviation was used to summarize the pretest and posttest scores. To determine the effectiveness of each teaching strategy while controlling for initial academic differences, a paired samples t-test and an analysis of variance (ANOVA) was conducted. This will allow the researcher to compare posttest results while accounting for variations in pretest performance.

Ethical Consideration

This study upholds all the ethical standards necessary. Informed consent is obtained from all participants, students, and their parents or guardians about the study's purpose, procedures, and voluntary nature of participation. Anonymity is preserved by assigning unique codes instead of using names- all data is handled confidential and stored securely. Ethical approval is also secured from the University Research Ethics Committee to ensure that all activities conformed with institutional research guidelines.

RESULTS AND DISCUSSION

Table 1 Pre and Post academic performance of students in Mathematics Intervention Program

Factors	Pre Intervention			Post Intervention		
	Mean Score	SD	Interpretation	Mean Score	SD	Interpretation
Differentiated Instruction	8.0000	2.75495	Fairly Satisfactory	12.3500	4.09221	Satisfactory
Direct Instruction	9.1944	3.09672	Fairly Satisfactory	11.7222	2.88455	Satisfactory
Collaborative Learning	8.4390	3.31699	Fairly Satisfactory	10.0000	3.04959	Satisfactory

Note: n = 117. Legend 90 - 100% (15 – 20) Outstanding, 85 – 89% (13 - 14) Very Satisfactory, 80 – 84% (10 - 12) Satisfactory, 75 - 79% (8 - 9) Fairly Satisfactory, 74 and below (0 – 7) Did not meet expectation

Table 1, titled Pre and Post Academic Performance of Students in Mathematics Intervention Program, presents the mean scores of students before and after the implementation of three teaching strategies namely Differentiated Instruction, Direct Instruction, and Collaborative Learning. The results show that all three strategies demonstrated an increase in students' academic performance from pre-intervention to post-intervention.

For Differentiated Instruction, the pre-intervention mean percentage score is 8.0000 with a standard deviation of 2.75495, interpreted as Fairly Satisfactory. After the intervention, the mean increased to 12.3500 with a standard deviation of 4.09221, interpreted as Satisfactory. This indicates a substantial improvement in student performance following the application of differentiated teaching approaches.

Similarly, for Direct Instruction, the pre-intervention mean is 9.1944 with a standard deviation of 3.09672, also interpreted as Fairly Satisfactory. The post-intervention mean increased to 11.7222 with a standard deviation of 2.88455, interpreted as Satisfactory. This suggests that structured and teacher-centered instruction contributed positively to students' academic outcomes.

For Collaborative Learning, the pre-intervention mean is 8.4390 with a standard deviation of 3.31699, interpreted as Fairly Satisfactory. After the intervention, the mean improved to 10.0000 with a standard deviation of 3.04959, interpreted as Satisfactory. This indicates that group-based learning also contributed to improved academic performance, although to a lesser extent compared to the other strategies.

Overall, the findings indicate that all three teaching strategies led to improvements in students' academic performance, moving from Fairly Satisfactory to Satisfactory. This suggests that the Mathematics Intervention Program was effective in enhancing student learning outcomes across different instructional approaches.

Table 2 Difference in the pre and post intervention academic performance of students in a Mathematics Intervention Program

Factors		N	Mean	SD	t	df	p	Interpretation	Decision
Differentiated Instruction	Pre	40	8.0000	2.75495	-6.101	39	.000	Significant	Reject Ho
	Post	40	12.3500	4.09221					
Direct Instruction	Pre	36	9.1944	3.09672	-4.817	35	.000	Significant	Reject Ho
	Post	36	11.7222	2.88455					
Collaborative Learning	Pre	41	8.4390	3.31699	-2.777	40	.008	Significant	Reject Ho
	Post	41	10.0000	3.04959					

Table 2 presents the results of the paired samples t-test used to determine whether there is a significant difference between the pre- and post-intervention academic performance of students under each teaching strategy.

For Differentiated Instruction, the computed t-value is -6.101 with 39 degrees of freedom and a p-value of .000, which is less than the level of significance ($p < 0.05$). This result is interpreted as significant, leading to the rejection of the null hypothesis. This indicates that the improvement from pre-test (mean = 8.0000, SD = 2.75495) to post-test (mean = 12.3500, SD = 4.09221) is statistically significant. For Direct Instruction, the t-value is -4.817 with 35 degrees of freedom and a p-value of .000, also indicating a significant difference and leading to the rejection of the null hypothesis. This confirms that the increase from a pre-test mean of 9.1944 (SD = 3.09672) to a post-test mean of 11.7222 (SD = 2.88455) is statistically meaningful. For Collaborative Learning, the t-value is -2.777 with 40 degrees of freedom and a p-value of .008, which is still less than 0.05. This indicates a significant difference and leads to the rejection of the null hypothesis. The increase from a pre-test mean of 8.4390 (SD = 3.31699) to a post-test mean of 10.0000 (SD = 3.04959) is therefore statistically significant.

Overall, the results indicate that all three teaching strategies produced statistically significant improvements in students' academic performance. This confirms the effectiveness of the Mathematics Intervention Program in enhancing learning outcomes.

Table 3 Teaching strategy that results in the highest academic gains among Grade 10 students needing academic support

Factors	N	Mean Score Difference	SD	F	p	Interpretation	Decision
Differentiated Instruction	40	4.3500	4.50953	5.558	.005	Significant	Reject Ho
Direct Instruction	36	2.5278	3.14857				
Collaborative Learning	41	1.5610	3.59895				

Table 3 presents the comparison of academic gains among the three teaching strategies to determine which approach resulted in the highest improvement in student performance. The analysis was conducted using one-way ANOVA.

The results show that Differentiated Instruction obtained the highest mean score difference of 4.3500 with a standard deviation of 4.50953, followed by Direct Instruction with a mean difference of 2.5278 and a standard deviation of 3.14857, and Collaborative Learning with a mean difference of 1.5610 and a standard deviation of 3.59895. The computed F-value is 5.558 with a p-value of .005, which is less than the level of significance ($p < 0.05$). This result is interpreted as significant, leading to the rejection of the null hypothesis. This indicates that there is a statistically significant difference in the academic gains among the three teaching strategies.

Overall, the findings reveal that Differentiated Instruction resulted in the highest academic gains, followed by Direct Instruction and Collaborative Learning. This suggests that tailoring instruction to meet the diverse needs, abilities, and learning styles of students is the most effective approach in improving academic performance among students in the intervention program.

Overall interpretation

Taken together, the results of Tables 1 to 3 provide strong evidence that the Mathematics Intervention Program was effective in improving students' academic performance. All three teaching strategies led to significant improvements; however, Differentiated Instruction emerged as the most effective strategy, yielding the highest academic gains.

These findings imply that instructional approaches that are responsive to individual learner differences are more effective in addressing learning gaps among students requiring academic support. While Direct Instruction and Collaborative Learning also contributed positively, their impact was relatively lower compared to Differentiated Instruction. These results suggest that educators should prioritize the use of differentiated strategies in intervention programs, as they provide flexible and targeted learning experiences that cater to students' varying needs. Furthermore, integrating multiple teaching strategies may enhance overall effectiveness, but emphasis should be placed on learner-centered approaches to maximize academic achievement.

CONCLUSION

This study, titled Assessing the Effectiveness of Diverse Teaching Strategies on Academic Performance of Students in the Intervention Program, aimed to determine the effectiveness of Differentiated Instruction, Direct Instruction, and Collaborative Learning in improving the academic performance of Grade 10 students needing academic support. Based on the findings, it can be concluded that the Mathematics Intervention Program was effective in enhancing students' academic performance across all three teaching strategies.

The results revealed that students' performance significantly improved from Fairly Satisfactory to Satisfactory after the implementation of the intervention program. Statistical analysis further confirmed that these improvements were significant, indicating that the strategies employed had a meaningful impact on students' learning outcomes. Among the three strategies, Differentiated Instruction yielded the highest academic gains, followed by Direct Instruction and Collaborative Learning. This suggests that instruction tailored to the diverse needs, abilities, and learning styles of students is the most effective approach in improving academic performance, particularly among learners who require additional academic support.

Overall, the findings affirm that the use of varied and responsive teaching strategies plays a crucial role in addressing learning gaps and promoting academic success. The study highlights the importance of adopting learner-centered approaches in intervention programs to maximize student achievement in Mathematics.

RECOMMENDATIONS

In light of the findings and conclusions of the study, the following recommendations are proposed:

Educational institutions are encouraged to adopt and strengthen Differentiated Instruction as a primary strategy in Mathematics intervention programs, as it has been shown to produce the highest academic gains among students. Teachers should be provided with continuous professional development and training on how to effectively design and implement differentiated learning activities that address the diverse needs of learners.

Teachers may also integrate Direct Instruction and Collaborative Learning alongside Differentiated Instruction to create a balanced and comprehensive teaching approach. While Differentiated Instruction is the most effective, combining multiple strategies may further enhance student engagement and understanding.

School administrators should support intervention programs by providing adequate instructional materials, resources, and time for remediation activities. Monitoring and evaluation mechanisms should also be strengthened to ensure the continuous improvement of intervention strategies.

Future researchers are encouraged to conduct similar studies with larger samples and in different contexts to validate and extend the findings of this study. Further research may also explore additional teaching strategies or variables, such as student motivation, learning styles, and teacher competencies, to gain a deeper understanding of factors influencing academic performance.

Lastly, it is recommended that students be actively involved in their learning process by encouraging self-directed learning, collaboration, and participation in intervention activities, as these can further enhance their academic development and overall performance.

REFERENCES

1. Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. Basic Books.
2. Johnson, D. W., & Johnson, R. T. (2009). An Educational Psychology Success Story: Social Interdependence Theory and Cooperative Learning. *Educational Researcher*, 38, 365-379. <https://doi.org/10.3102/0013189X09339057>
3. Rosenshine, B. (2012). Principles of instruction: Research-based strategies that all teachers should know. *American Educator*, 36(1), 12–39. <https://eric.ed.gov/?id=EJ971753>
4. Slavin, R. E., Lake, C., Davis, S., and Madden, N.A. (2017). Effective programs for struggling readers: A best-evidence synthesis. *Phi Delta Kappan*, 98(7), 48–52. <https://doi.org/10.1016/j.edurev.2010.07.002>
5. Tomlinson, C. A. (2001). *How to Differentiate Instruction in Mixed-Ability Classrooms*. Upper Saddle River, NJ: Pearson Education.
6. Vygotsky, L. S. (1978). *Mind in society. The development of higher psychological processes*. Cambridge: Harvard University Press.