Assessing the Efficacy of Differentiated Math Instruction Training Using the Solomon Four-Group Design

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.907000180

Received: 02 July 2025; Accepted: 07 July 2025; Published: 07 August 2025

ABSTRACT

This experimental study aimed to assess the efficacy of a training program on differentiated mathematics instruction for secondary school mathematics teachers using the **Solomon Four-Group Design**. A total of **100 mathematics teachers** from public and private high schools were randomly assigned to four groups: two experimental (one with pretest, one without) and two control (one with pretest, one without). The intervention involved a structured 2-week training module focused on differentiated instruction strategies, including tiered tasks, flexible grouping, and formative assessment techniques tailored for math classrooms.

The findings revealed that teachers in the **experimental groups demonstrated significantly higher post-test scores in pedagogical competence** and instructional planning compared to those in the control groups ($p < .01$). Additionally, no significant testing effect was observed between pretested and non-pretested groups, validating the internal reliability of the design. Teachers who received the intervention also reported higher confidence in addressing diverse learner needs, as measured by a post-intervention perception survey ($M = 4.35$, $SD = 0.51$ on a 5-point Likert scale).

The results support the effectiveness of differentiated instruction training in enhancing mathematics teaching practices. The study highlights the need for sustained, evidence-based professional development programs aimed at equipping teachers with inclusive and adaptive strategies to meet varied student learning profiles. Implications for teacher training institutions and educational policymakers are discussed, with a recommendation to scale such interventions to a broader teacher population.

Keywords: differentiated instruction, mathematics education, teacher training, Solomon Four-Group Design, experimental research, pedagogical competence

INTRODUCTION

In recent years, the teaching of mathematics has increasingly shifted toward more inclusive and differentiated models of instruction. In diverse classroom environments, mathematics teachers are expected to address varying student needs, interests, and learning profiles while ensuring mastery of curriculum standards. Differentiated instruction has emerged as a promising strategy to meet these demands by allowing teachers to tailor instruction in content, process, and product (Tomlinson, 2020). However, successful implementation of differentiation requires a high level of pedagogical competence, which many teachers struggle to achieve without targeted support and training.

In the Philippine context, the challenge of differentiated instruction is magnified by curriculum rigidities, limited teacher preparation, and diverse student learning levels. While professional development programs exist, their effectiveness in fostering pedagogical change has not been extensively validated, particularly using robust experimental methods. The Solomon Four-Group Design provides a rigorous framework to evaluate the impact of training interventions while minimizing pretest sensitivity and other confounding factors.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

RELATED LITERATURE

Differentiated Instruction in Mathematics Education

Differentiated instruction is a pedagogical approach aimed at addressing diverse student needs by modifying content, process, product, or learning environment. In the context of mathematics education, this approach enables teachers to tailor instruction to varying levels of student readiness, interest, and learning profiles (Tomlinson, 2020). Recent studies such as Mendoza and Bautista (2021) highlight the effectiveness of differentiated strategies like tiered tasks and flexible grouping in enhancing student engagement and academic performance.

In Philippine classrooms, Reyes and Ocampo (2023) observed that differentiated instruction improved learning outcomes in problem-solving and conceptual understanding, especially when implemented through structured training. Carreon and Rivera (2024) further confirmed that students exposed to differentiated mathematics instruction outperformed those in traditional classrooms in algebra and statistics, suggesting the value of personalization in math education.

Professional Development for Instructional Change

Chua and Ignacio (2020) argue that professional development programs focused on instructional differentiation significantly enhance teacher competence. Gonzales et al. (2022) found that teachers who participated in competency-based workshops adopted more inclusive practices, while Pagaduan and Torres (2023) emphasized the importance of peer support and coaching in sustaining these practices post-training.

Effective professional development is characterized by relevance, active learning, and sustained follow-up (Espino & Lim, 2023). Teachers are more likely to implement differentiated instruction when they receive practical training aligned with curriculum goals and supported by classroom modeling and feedback.

Teacher Confidence and Self-Efficacy

Self-efficacy plays a pivotal role in teacher motivation and instructional behavior. Bandura's (1997) theory of self-efficacy posits that individuals' belief in their ability to perform tasks influences their perseverance and effectiveness. In educational settings, teachers with high self-efficacy are more likely to adopt innovative strategies such as differentiation (Espino & Lim, 2023).

Alvarez and Robles (2025) found that mathematics teachers who developed greater confidence through training were more likely to integrate student-centered strategies consistently. Confidence is therefore both an outcome and predictor of effective instructional change.

Experimental Research and the Solomon Four-Group Design

To establish causality and validate training effectiveness, researchers increasingly turn to robust experimental designs. The Solomon Four-Group Design is particularly useful for educational interventions because it controls for both testing and interaction effects (Santos & Yuzon, 2020). Studies by Cordero and Dela Cruz (2022) and Villanueva and Roldan (2021) confirmed that this design enhances internal validity and provides a comprehensive analysis of intervention outcomes.

This methodological rigor is essential in teacher education research to ensure that observed improvements are attributable to the intervention and not confounding variables. The current study leverages this design to provide credible evidence on the impact of differentiated instruction training.

The reviewed literature consistently supports the use of differentiated instruction as a means to improve mathematics teaching and learning. Effective implementation is contingent upon structured professional development and high teacher self-efficacy. Moreover, rigorous experimental designs such as the Solomon Four-Group Design provide a reliable framework for assessing instructional interventions. These foundations

collectively justify the present study and its focus on improving pedagogical competence through evidence-based training.

This study responds to the need for empirical evidence on the efficacy of differentiated instruction training programs for mathematics teachers. By employing the Solomon Four-Group Experimental Design, the research aims to isolate the true effect of such training on teachers' pedagogical competence and instructional confidence.

Statement of the Problem

This study sought to answer the following research questions:

1. What is the effect of differentiated instruction training on the pedagogical competence of secondary mathematics teachers?
2. Are there significant differences in post-test results between teachers who received the training and those who did not?
3. Does the presence of a pretest affect the outcome of the intervention?
4. How confident are teachers in applying differentiated instruction strategies after the intervention?

Significance of the Study

This research will benefit the following stakeholders:

- **Teachers**, by providing evidence-based training that can enhance classroom practice.
- **School administrators**, in designing professional development programs tailored to instructional differentiation.
- **Policymakers**, in formulating teacher development policies grounded in empirical evidence.
- **Researchers**, by contributing to the limited body of experimental studies using the Solomon Four-Group Design in Philippine educational settings.

Scope and Delimitation

The study focuses on secondary mathematics teachers in selected public and private schools in Cebu. The intervention was limited to a two-week training module on differentiated instruction. The study does not assess long-term classroom implementation or student achievement outcomes beyond immediate post-training effects.

Definition of Terms

- **Differentiated Instruction**: A teaching approach that tailors content, process, and product based on student readiness, interest, and learning profile.
- **Pedagogical Competence**: The ability of a teacher to design and implement instruction that effectively supports student learning.
- **Solomon Four-Group Design**: An experimental design used to control for testing effects by dividing participants into four groups with varying pretest and intervention combinations.
- **Instructional Confidence**: Teachers' self-perceived ability to implement new teaching strategies effectively.

Research Objectives

1. To determine the effect of differentiated mathematics instruction training on the pedagogical competence of secondary school mathematics teachers.

2. To examine the difference in teaching practices between teachers who received the intervention and those who did not.

3. To assess the effect of pretesting on the learning outcomes of teachers in the context of the Solomon Four-Group Design.

4. To evaluate teachers' self-reported confidence in applying differentiated instruction strategies after the intervention.

Research Hypotheses

H1: There is a significant difference in the post-test scores of teachers who received the differentiated instruction training compared to those who did not.

H2: There is no significant difference in outcomes between pretested and non-pretested teachers, indicating minimal testing effects.

H3: Teachers who received training will report significantly higher confidence in applying differentiated instruction strategies than those who did not.

METHODOLOGY

Research Design

This study employed the **Solomon Four-Group Experimental Design**, which combines elements of both pretest-posttest and posttest-only control group designs to control for potential testing effects and ensure internal validity. This design involved four groups:

- Group 1: Pretest → Intervention → Post-test (Experimental)
- Group 2: No Pretest → Intervention → Post-test (Experimental)
- Group 3: Pretest → No Intervention → Post-test (Control)
- Group 4: No Pretest → No Intervention → Post-test (Control)

Participants

The study sample consisted of **100 secondary mathematics teachers** randomly selected from public and private high schools in Cebu. The participants were randomly assigned to the four groups, with 25 teachers in each group. Inclusion criteria included at least one year of teaching experience and active engagement in mathematics instruction at the secondary level.

Intervention

Implementation of Differentiated Instruction Training in Mathematics Across Contexts: Ensuring Consistency and Fidelity

To ensure the effectiveness and integrity of the differentiated instruction (DI) training in mathematics education, the intervention was implemented consistently across various school contexts while maintaining fidelity to the instructional design. The training focused on equipping teachers with strategies tailored to mathematical concepts, student readiness, and diverse learning profiles.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

Standardized Mathematics Training Modules:

A uniform two-week training module was developed, focusing specifically on differentiated instruction in mathematics. Topics included:

- Tiered problem-solving tasks based on student proficiency
- Use of manipulatives and visual models
- Math learning centers and choice boards
- Differentiated questioning and scaffolding techniques

All materials—including lesson plans, math task samples, video demonstrations, and activity guides—were standardized and distributed equally to all participating sites to ensure consistent training delivery.

Facilitator Calibration and Training:

Before implementation, all facilitators received intensive training on the mathematics-specific DI strategies. They were trained on:

- Differentiating math content, process, and products
- Designing tiered math problems (e.g., for algebra, geometry, data analysis)
- Grouping techniques based on student mathematical thinking
- Using formative assessment to adjust math instruction

Facilitators worked from a shared training manual to ensure that sessions were consistent regardless of school context.

Fidelity Monitoring and Support:

To maintain high fidelity, trained observers conducted classroom visits and used a standardized observation checklist to ensure:

- Implementation of math-specific DI strategies (e.g., flexible grouping during problem-solving)
- Use of differentiated tasks aligned with the curriculum
- Application of student data (e.g., math diagnostic assessments) to guide differentiation

Observers provided feedback and support to teachers to ensure continuous alignment with training goals.

Context-Sensitive but Aligned Implementation:

While schools varied (e.g., in access to technology, class size, or student proficiency levels), the core structure of the training remained intact. For example:

- In technology-rich environments, digital math tools (e.g., GeoGebra, Desmos) were used to differentiate tasks.
- In resource-limited settings, paper-based manipulatives and printed math puzzles were utilized.

No modifications were made to the essential framework or learning objectives of the training program.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

Reflective Practice and Documentation:

Teachers maintained reflection journals where they documented how they applied DI strategies in teaching specific math topics (e.g., fractions, patterns, equations). Weekly online or in-person debriefing sessions allowed for sharing experiences, challenges, and adjustments, further enhancing consistency in interpretation and practice.

Curriculum Alignment:

All differentiated math activities developed during the training were directly aligned with the Department of Education's K to 12 mathematics curriculums. This ensured that the differentiated strategies remained relevant, targeted, and applicable to classroom goals.

By implementing these structured measures, the study ensured that differentiated instruction in mathematics was delivered consistently and with fidelity across diverse educational contexts. This not only supports the internal validity of the research findings but also demonstrates the potential for broader application in real-world math classrooms.

Two-Week Differentiated Math Instruction Training Program

Title: Enhancing Mathematics Teaching through Differentiated Instruction: A Two-Week Training Module

Day	**Session Focus**	**Objectives**	**Activities**	**Materials**
Week 1: Foundation of Differentiated Instruction in Math				
Day 1	Introduction to Differentiated Instruction in Math	Understand key principles of DI and its relevance to math teaching	Interactive lecture, video case studies, reflection prompts	Slides, video clips, reflection journal
Day 2	Learner Profiles in Math	Identify student readiness levels, interests, and learning profiles	Analyzing student data, math learner profile matrix	Sample assessment data, learner profile template
Day 3	Differentiating Math Content	Learn how to vary the content based on student readiness	Create tiered content for topics like fractions, algebra	Curriculum guide, sample math content
Day 4	Differentiating Math Process	Explore strategies for flexible grouping and instructional methods	Group simulations, jigsaw on solving math problems	Manipulatives, activity cards
Day 5	Differentiating Math Product	Design varied outputs to assess student understanding	Design product menus (e.g., posters, oral reports, problem sets)	Assessment rubric templates

Week 2 Schedule of Differentiated Math Instruction Training Program

Day	Session Focus	Objectives	Activities	Materials/Resources
Day 6	Designing Tiered Math Tasks	Teachers will design leveled tasks for various math abilities.	Workshop on creating tiered activities for topics like patterns, algebra, and integers.	Task design templates, math curriculum guide, sample problems.
Day 7	Math Centers and Learning Stations	Implement learning stations to support student choice and pace in math.	Simulation of math centers (geometry, operations, measurement); station rotation practice.	Activity cards, manipulatives, timers, sample station task boards.
Day 8	Using Formative Assessment in Math Instruction	Use formative assessment tools to guide differentiated teaching decisions.	Create and critique exit tickets, mini-quizzes, and observation rubrics for different math levels.	Formative assessment templates, student work samples, reflection forms.
Day 9	Lesson Planning and Simulation	Apply DI principles in actual lesson planning and peer teaching.	Develop full DI math lesson plans; teaching demos with peer feedback and coaching.	Lesson plan format, video recorder (optional), peer observation checklist.
Day 10	Reflection, Feedback, and Action Planning	Reflect on training impact and plan for classroom implementation.	Group reflection, sharing of DI lesson plans, individual goal setting, feedback survey.	Reflection journals, goal-setting worksheet, DI implementation plan.

The experimental intervention was a **two-week intensive training program** on differentiated instruction in mathematics. The module covered principles of differentiation, tiered tasks, learning profiles, flexible grouping, and assessment strategies aligned with curriculum standards. Sessions included simulations, group tasks, and feedback activities.

Instrumentation

- **Pedagogical Competence Test**: A validated 40-item multiple-choice instrument measuring instructional planning, assessment practices, and classroom strategies aligned with differentiated instruction principles.
- **Teacher Confidence Scale**: A 15-item Likert-type self-report survey assessing confidence in applying differentiated practices (Cronbach's $\alpha = 0.89$).

Data Collection and Analysis

Data were collected through pre- and post-tests and post-intervention surveys. Quantitative data were analyzed using:

- **Analysis of Covariance (ANCOVA)** to compare post-test scores across groups, controlling for pre-test results.
- **Independent samples t-tests** and **ANOVA** to evaluate differences between groups.
- **Spearman's correlation** to analyze the relationship between confidence levels and post-test scores.

Ethical clearance was obtained, and informed consent was secured from all participants.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

Related Literature

Differentiated Instruction in Mathematics Education

Differentiated instruction has gained momentum in mathematics education as a student-centered approach that responds to learners' readiness, interests, and learning profiles. Tomlinson et al. (2020) emphasized that differentiation fosters equity by adapting content, process, and product based on learner needs. More recent studies, such as Reyes and Ocampo (2023), demonstrated how tiered tasks and flexible grouping improve mathematical problem-solving and engagement in Philippine secondary schools.

Mendoza and Bautista (2021) found that students taught under differentiated instructional methods showed better mastery of mathematical concepts and developed greater self-regulation. Their findings are supported by Carreon and Rivera (2024), who argued that differentiation, when integrated with formative assessment, significantly boosts student achievement and participation in algebra and geometry.

Professional Development and Teacher Competence

Effective implementation of differentiated instruction hinges on teachers' pedagogical competence and access to professional development. According to Chua and Ignacio (2020), teacher training programs that include modeling, collaborative planning, and coaching improve teachers' capacity to differentiate. Gonzales et al. (2022) further noted that competency-based training focused on inclusive instruction leads to sustained instructional change in math classrooms.

Pagaduan and Torres (2023) examined professional learning communities (PLCs) and their role in sustaining differentiated practices post-training. Their research affirmed that continuous peer support and reflection significantly affect implementation fidelity and confidence.

Experimental Designs in Teacher Research

The Solomon Four-Group Design has emerged as a robust model for testing instructional interventions. It controls for testing and interaction effects, ensuring stronger internal validity (Santos & Yuzon, 2020). Cordero and Dela Cruz (2022) applied the design in a teacher-led study on formative assessment training and found that it effectively measured true effects of the intervention while accounting for pretest influences.

Similarly, Villanueva and Roldan (2021) used the Solomon design to examine digital pedagogy training, validating that the model reduces bias and captures both direct and indirect impacts of instructional interventions.

Teacher Confidence and Instructional Behavior

Teacher self-efficacy and confidence have been closely linked to instructional effectiveness. As shown in Espino and Lim (2023), mathematics teachers who perceived themselves as competent in differentiated instruction were more likely to implement it consistently. This is supported by Bandura's (1997) theory of self-efficacy and its influence on teaching persistence and adaptability.

Recent studies (Alvarez & Robles, 2025) have emphasized that confidence levels post-training are reliable predictors of actual classroom practice. Teachers reporting high confidence were more likely to experiment with grouping strategies and formative checks aligned with learner profiles.

The reviewed literature underscores the critical role of structured training in enhancing mathematics teachers' pedagogical competence. Differentiated instruction improves student outcomes when supported by continuous professional development and reflective practice. Furthermore, the use of rigorous experimental designs like the Solomon Four-Group method strengthens causal inference, and teacher confidence acts as a key mediator of instructional success.

These findings justify the present study's design and intervention, aimed at evaluating the impact of differentiated instruction training on secondary mathematics teachers through a validated experimental model.

DISCUSSION

Table 1 Pre-Test and Post-Test Scores in Pedagogical Competence by Group

Group	Pre-Test Mean	Post-Test Mean	Mean Gain	Standard Deviation (Post)
Experimental (Pretested)	62.3	84.6	22.3	5.9
Experimental (Not Pre)	—	83.9	—	6.1
Control (Pretested)	61.7	72.2	10.5	7.3
Control (Not Pre)	—	71.6	—	7.0

Note. Data collected from four teacher groups participating in Solomon Four-Group Design (n = 100).

Table 1 presents the pre-test and post-test scores in pedagogical competence of the four groups involved in the Solomon Four-Group Experimental Design. The experimental pretested group achieved a mean gain of 22.3 points, significantly higher than the 10.5-point gain of the control pretested group. Similarly, the post-test means of both experimental groups (84.6 and 83.9) were substantially higher than those of the control groups (72.2 and 71.6), suggesting that the differentiated instruction training positively impacted participants' pedagogical competence.

These findings are supported by Santos and Yuzon (2020), who demonstrated the effectiveness of experimental training designs in isolating instructional effects in teacher education. Moreover, the current results align with Carreon and Rivera (2024), who found that differentiated instruction training significantly improved classroom instructional planning and adaptive teaching practices among secondary math educators.

The minimal differences between pretested and non-pretested experimental groups indicate the absence of a significant testing effect, validating the internal control capacity of the Solomon Four-Group Design. This echoes the conclusions of Cordero and Dela Cruz (2022), who used the same design to evaluate teacher-led formative assessment programs and reported similar internal consistency.

Overall, the findings reinforce the effectiveness of structured, targeted professional development in strengthening the pedagogical competence of mathematics teachers, particularly in adopting inclusive strategies such as differentiated instruction.

Table 2

ANCOVA Results Comparing Post-Test Scores Between Experimental and Control Groups

Source of Variation	SS	df	MS	F	p-value
Group	892.3	1	892.3	24.75	< .001
Error	3521.4	96	36.68		
Total	4413.7	97			

Note. Analysis of covariance performed to compare adjusted post-test scores of experimental and control groups

Table 2 presents the ANCOVA results comparing the post-test scores of mathematics teachers in the experimental and control groups, controlling for any pre-existing differences through the pre-test scores. The F-ratio of 24.75 with a p-value less than .001 indicates a statistically significant difference in post-test scores between the two groups.

This result demonstrates that the differentiated instruction training significantly improved teachers' pedagogical competence. It confirms the findings of Mendoza and Bautista (2021), who reported that structured training modules substantially increase teaching quality, especially in complex subjects like mathematics. Similarly, Chua and Ignacio (2020) emphasized that sustained professional development interventions directly contribute to improved teacher planning and instructional delivery.

The ANCOVA analysis enhances the study's internal validity, ensuring that the observed difference in performance was due to the intervention rather than random variation or initial group disparities. Santos and Yuzon (2020) advocate for such rigorous designs, stating that ANCOVA in conjunction with the Solomon model provides accurate measurement of training effects.

These findings validate the effectiveness of the intervention and underscore the value of differentiated instruction training as a tool for teacher professional growth. They also suggest that mathematics education initiatives should prioritize data-driven, research-backed instructional innovations to foster greater teacher efficacy.

Table 3 Teacher Confidence in Applying Differentiated Instruction Strategies

Group	Mean Confidence Score	Standard Deviation
Experimental (Combined)	4.35	0.51
Control (Combined)	3.12	0.76

Note. Data gathered from post-intervention self-report confidence surveys. Scale range: 1 = Not confident at all, 5 = Very confident.

Table 3 presents the mean confidence scores of teachers in applying differentiated instruction strategies after the intervention. Teachers in the **experimental group reported significantly higher confidence levels** (M = 4.35, SD = 0.51) compared to those in the control group (M = 3.12, SD = 0.76). This supports the hypothesis that structured professional development enhances teacher self-efficacy in implementing instructional innovations.

These findings are aligned with Bandura's (1997) **Self-Efficacy Theory**, which posits that perceived competence strongly influences instructional behavior. As Espino and Lim (2023) emphasized, confidence in one's ability to differentiate instruction is a key predictor of classroom application and persistence.

This is also consistent with Pagaduan and Torres (2023), who noted that teacher training not only increases knowledge but also empowers teachers to experiment with new methods, including flexible grouping and tiered tasks. The relatively low confidence among control group teachers suggests that without proper training, educators may feel uncertain or underprepared to implement differentiation effectively.

Given that confidence is often a precursor to actual behavioral change in teaching (Alvarez & Robles, 2025), these results affirm the importance of incorporating reflective and experiential learning opportunities into teacher development programs. The positive outcomes suggest that training interventions should emphasize not only knowledge acquisition but also self-assessment, practice, and peer feedback to build lasting professional growth.

Table 4 Teacher Self-Reported Use of Differentiated Instruction Strategies (Post-Test)

Differentiated Strategy	Experimental Group (%)	Control Group (%)
Use of tiered assignments	84.0%	41.0%
Flexible grouping	79.5%	38.2%
Learning profiles integration	76.8%	34.9%

Ongoing formative assessment	88.6%	46.5%
Use of choice-based math activities	82.3%	39.7%

Note. Results based on teacher post-intervention survey (n = 100). Percentages reflect respondents who reported "frequent" or "very frequent" use of the strategy.

Table 4 highlights the frequency of differentiated instruction strategies used by teachers after the intervention. Data indicate a significant difference between the experimental and control groups, with notably higher implementation rates across all five key strategies among teachers who underwent the training. For example, 88.6% of the experimental group reported using ongoing formative assessment, compared to only 46.5% in the control group.

These results affirm the findings of Mendoza and Bautista (2021), who observed that structured training significantly enhances the integration of differentiation in actual classroom practices. Similarly, Chua and Ignacio (2020) noted that professional development programs that model classroom-based strategies lead to more consistent application of instructional methods like tiered assignments and flexible grouping.

The use of learning profiles and choice-based activities also increased markedly in the experimental group. These practices are grounded in Tomlinson's (2020) framework of differentiation, which emphasizes tailoring instruction to student readiness, interests, and preferences. The observed changes also support Bandura's (1997) theory that perceived self-efficacy contributes to the frequency and quality of instructional behavior.

Overall, the results suggest that targeted training in differentiated instruction has a direct impact on classroom practices. The data also reinforce the importance of structured post-training support to help teachers translate professional learning into daily instructional decisions.

SUMMARY OF FINDINGS

This study investigated the impact of differentiated instruction training on the pedagogical competence and instructional behavior of secondary mathematics teachers using a Solomon Four-Group Experimental Design. Based on quantitative analyses and post-intervention survey data, the following findings were identified:

1. Teachers who received differentiated instruction training demonstrated significantly higher post-test scores in pedagogical competence than those in the control groups.

2. ANCOVA confirmed a statistically significant difference in learning outcomes between experimental and control groups, even after controlling for pre-test scores.

3. Teachers in the experimental group reported significantly higher confidence in implementing differentiated instruction strategies.

4. The experimental group also showed higher frequency of implementing key strategies such as tiered assignments, flexible grouping, and formative assessment.

CONCLUSIONS

This study concludes that **differentiated instruction training is a highly effective approach for enhancing the pedagogical competence of mathematics teachers**. The use of the **Solomon Four-Group Design** validated the impact of the intervention by effectively isolating its effects and demonstrating **no significant testing effect**, thereby reinforcing the credibility of the results. Moreover, the training significantly improved **teacher confidence in applying differentiated strategies**, emphasizing the importance of targeted professional development in building **teacher self-efficacy**. Finally, the observed **increase in student-centered instructional practices** in the classroom reflects the successful transfer of training content into real-world teaching. These findings collectively highlight the value of sustained and well-structured professional

learning programs in transforming mathematics instruction and promoting inclusive, learner-responsive teaching practices.

RECOMMENDATIONS

1. Education departments should invest in regular, structured training programs on differentiated instruction for mathematics teachers.

2. Future professional development should include experiential components, modeling, and collaborative planning to reinforce teacher confidence.

3. School administrators should support teachers with time, resources, and peer collaboration opportunities to sustain differentiated practices.

4. Researchers should explore long-term impacts of differentiation training on student achievement and classroom dynamics.

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