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ADAPTING DIFFERENTIATED INSTRUCTION IN TEACHING MATHEMATICS: AN APPROACH TO ENHANCE LEARNING

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ABSTRACT:

The study concluded that mathematics teachers exhibit a very high level of knowledge and application of differentiated instruction across all domains—content, process, product, and learning environment. This suggests a strong capacity among educators to tailor their instruction to meet the diverse learning needs of students. However, findings from the regression analysis indicate that certain aspects of the teachers' profiles, particularly educational qualifications and grade level taught, significantly influence their implementation of differentiated strategies, especially in terms of process and product. Conversely, years of teaching experience showed a marginally negative influence on content and learning environment differentiation, highlighting the need for continuous professional development for veteran educators. Moreover, qualitative insights from Phase 2 of the study reveal that teachers are intentional in identifying learner needs through readiness assessments and observational techniques. They apply various instructional tools and adaptive strategies—such as visual aids, manipulatives, scaffolding, and peer collaboration—to foster learner engagement and conceptual mastery. These differentiated approaches not only address gaps in student understanding but also contribute to increased confidence and motivation, especially among struggling learners. Overall, the results affirm that differentiated instruction, when properly implemented, leads to more inclusive, responsive, and effective mathematics teaching. Yet, sustaining this approach requires systemic support in the form of policy alignment, resource availability, and targeted training. To maximize impact, it is essential to strengthen institutional initiatives that encourage innovative teaching practices, promote equity in student learning experiences, and build teacher capacity in designing learner-centered environments that respond to the complexity of classroom diversity.

INTRODUCTION

A classroom is composed of diverse learners. Each has different learning needs that a teacher has to always consider. Mathematics learning can be fun when mathematical concepts are delivered to the level of learnings of the students. This can be done by employing different activities that suit to the needs of every learner. Eventually, this leads to appreciation and application of mathematical concepts into their own lives.

In the same vein, differentiated instruction in mathematics allowed learners to make sense of the situation as they engage in mathematical reasoning for knowledge construction. In fact, this is crucial as they geared towards mathematical literacy (Ng, 2023). There is a need for teachers to apply scaffolding in teaching as learners have varied needs, abilities, and achievement levels (Bal, 2023).

Moreover, differentiated instruction has increased the level of students' motivation to learn as revealed from the findings of Krishan and Al-rsa'I (2023). Eventually, this impacted their self-efficacy in learning mathematics (McNeill & Polly (2023). Modification of mathematical questions especially during the solving of problems, can make a significant difference of students' performance. Teachers did the clarification, decomposition, and code-switching (Zerai et al., 2023).

Though inclusivity has been observed by teachers in the four corners of the classroom. There is still the dire need to explore this topic especially among mathematics teachers in the local setting. Related studies on differentiated instruction are anchored on the utilization of digital video games (Hayak & Avidov-Ungar, 2020; Bang et al., 2023; Estaiteyeh & DeCoito, 2023), its influence on the academic performance of the university students in mathematics (Rudhumbu & Dziva, 2023), and in addressing learning gaps (Aguhayon et al., 2023). Thus, there is a need to further explore this study.

Eventually, this research can contribute to better understanding of how teachers reflect their learners' growth as they implement differentiated instruction. This may provide strategies for teachers' overall development in providing quality and inclusive education. Knowing the knowledge of teachers on differentiated instruction can have an impact on the delivery of mathematical concepts to students.

Research Questions

The main purpose of this study is to determine the knowledge of mathematics teachers on differentiated instruction. Specifically, it answers the following research questions:

Phase 1 Teachers' Characteristics and Knowledge on Differentiated Instruction in Mathematics

- What are the demographic profile of mathematics teachers in terms of grade level taught, highest educational qualification, rank, and years of teaching?
- What is the level of knowledge of mathematics teachers on differentiated instruction in terms of content, process, product and learning environment?
- Is there a significant influence of teachers' profile on their differentiated instruction?

Phase 2 On Learning Inclusivity: Application of Differentiated Instruction in Teaching Mathematics

- How do mathematics teachers apply differentiated instruction in teaching mathematical concepts to achieve learning inclusivity?
- How does differentiated instruction enhanced mastery of mathematical concepts?
- What intervention approach on differentiated instruction can be developed to enhance mathematical concepts?

METHODOLOGY

This chapter presents research design, locale of the study, data gathering procedure, respondents, research instrument, sampling procedure, statistical treatment, and ethical considerations.

Research Design

Phase 1

This phase will use the descriptive-correlational. In the initial quantitative phase, the researcher collects and analyzes numerical data using structure methods using the survey questionnaire. The primary goal of this phase is to gather quantitative data that can help answer research questions or test hypothesis (Bowen et al., 2017).

Quantitative research has been defined by Bauer et al. (2021) as an approach where the primary tool in interpreting the data is the use of statistics. Researchers will be able to test the hypothesis depending on the variables as well as the type of the problem being investigated. More importantly, this approach is important in providing meaning to the bigger population which may have an impact to the society or provide perspectives in educational milieu. In this study, the research will first describe the demographic characteristics of the respondents as well as their level of knowledge on differentiated instruction. Findings will be tested using statistical tool where a significant difference will be taken.

Phase 2

Likewise, qualitative underscores that research can be done by gathering words, pictures, audio, video, and other pertinent documents which could solidify the interpretation of the phenomenon (Sabnis et al., 2021). It is also very helpful as it strengthens the findings of the quantitative data especially if researchers have to engage into mixed methods. Indeed, this approach can be used in many aspects of social research.

On the contrary, the researcher will interview the mathematics teacher-participants. A phenomenological approach will be undertaken. Data will be collected through open-ended questions. In this phase, the researcher will interview the participants and determine the significant themes from their responses.

Respondents

The respondents of this study will be elementary teachers from 3rd Congressional District. They will be taken from the following schools as showed on the table below.

3rd Congressional District	**Respondents**	**Sample Size**
Kabacan	**55**	**33**
Matalam	**80**	**48**
Mlang	**60**	**36**
Tulunan	**75**	**44**
Total	**270**	**161**

Research Instrument

The research instruments will utilize both the questionnaire and interview guide. For the questionnaire, this will be divided into two parts. Part I will determine their profile, while Part II will seek to find the level of teachers practice of differentiated instruction. This will be lifted from the study of Tomlinson (2001). Responses will be rated using the scale as shown below:

Level	Mean	Descriptive Equivalent	Descriptive Interpretation
5	**4.20 – 5.00**	**Very High**	**The respondents have shown a very high level of practice of differentiated instruction.**
4	**3.40 – 4.19**	**High**	**The respondents have shown a high level practice of differentiated instruction.**
3	**2.60 – 3.39**	**Moderately High**	**The respondents have shown a moderately high level practice of differentiated instruction.**
2	**1.80 – 2.59**	**Fairly Low**	**The respondents have fairly low practice of differentiated instruction.**
1	**1.00 – 1.79**	**Very Low**	**The respondents have very low practice of differentiated instruction.**

Sampling Procedure

There will be two types of sampling to be employed in this study. First, the researcher will apply the simple random sampling (Jiang et al., 2020) among the population in each school of 4 towns in the 3rd congressional district of the Province of Cotabato. For the interview, the researcher will choose 5 from each town by employing the purposive sampling, specifically the criterion-based sampling (Obilor, 2023). Hence, teachers will be chosen by the following criteria:

- An elementary teacher;
- Teaching mathematics; and
- Assigned in 3rd Congressional District.

Data Analysis

Phase 1

- Weighted Mean. This will be used in determining the number of the respondents as well as their responses (Campbell & Rukhin, 2011).
- Regression Analysis. This will be used to test the significant influence of the profile on implementation of differentiated instruction in mathematics (Henson, 2015).

Phase 2

- Thematic Analysis. It will be used to determine significant themes. It offers a flexible and systematic approach for qualitative research, allowing researchers to explore complex data sets and derive meaningful insights (Braun & Clarke, 2023).

RESULTS AND DISCUSSIONS

Phase 1

Demographic Profile of mathematics teachers in terms of grade level taught, highest educational qualification, rank, and years of teaching.

The demographic profile of the 161 mathematics teachers revealed a balanced distribution across grade levels, with the highest number teaching Grade 4 (20.50%), followed by Grade 6 (18.01%) and Grade 1 (17.39%). Regarding educational qualifications, a significant proportion held a master's degree (40.37%) or had master's units (39.13%), while only a small number had doctoral-level education (1.87% combined). In terms of rank, most were Teacher I (40.37%), followed by Teacher III (26.09%) and Teacher II (22.98%), with only 8.07% and 2.49% holding Master Teacher I and II positions, respectively. Concerning teaching experience, the largest groups had 6–10 years (29.19%) and over 21 years (29.19%) of experience, indicating both early-career and seasoned professionals in the sample.

These findings imply that the mathematics teaching workforce in the studied area is composed of relatively well-qualified individuals, with many pursuing or completing graduate studies. However, the low percentage of teachers with doctoral qualifications and in higher-ranking positions suggests a need for institutional support in career progression and advanced professional development. The presence of both early-career and veteran teachers provides a promising environment for mentorship programs and collaborative learning communities, potentially enhancing instructional quality through shared experiences and innovations.

As stated by Kim and Jeong (2022), higher academic qualifications correlate with improved teaching strategies and student outcomes in mathematics. Likewise, Castillo and Barrot (2023) emphasize the importance of teacher career advancement pathways in promoting motivation and long-term professional engagement. Dela Cruz et al. (2021) found that diverse teaching experiences contribute positively to pedagogical adaptability and collaborative learning cultures in schools.

Demographic Profile	Category	Frequency (f) N= 161	Percentage (%)
A. Grade Level Taught			
	Grade 1	**28**	**17.39**
	Grade 2	**24**	**14.91**
	Grade 3	**26**	**16.15**
	Grade 4	**33**	**20.50**
	Grade 5	**21**	**13.04**
	Grade 6	**29**	**18.01**
B. Highest Educational Qualifications			
	BSED/ BS Mathematics	**30**	**18.63**
	With Units in Masters	**63**	**39.13**
	With Master's Degree	**65**	**40.37**
	With Units in Doctoral	**2**	**1.24**
	Doctoral	**1**	**0.63**
C. Rank			
	Teacher I	**65**	**40.37**
	Teacher II	**37**	**22.98**
	Teacher III	**42**	**26.09**
	Master Teacher I	**13**	**8.07**
	Master Teacher II	**4**	**2.49**
	Master Teacher III	**0**	**0**
D. Years of Teaching			
	1-5 years	**15**	**9.32**
	6-10 years	**47**	**29.19**
	11-15 years	**29**	**18.01**
	16-20 years	**23**	**14.29**
	21 years above	**47**	**29.19**

Level of knowledge of mathematics teachers on differentiated instruction in terms of content

The data reveal that mathematics teachers demonstrate a very high level of knowledge in implementing differentiated instruction with respect to content, with a weighted mean of 4.51. Specifically, teachers scored highest in adapting lesson content for varying student readiness levels (M = 4.57) and using diverse materials beyond standard textbooks (M = 4.55). Other indicators—such as articulating lesson concepts (M = 4.48), providing instructional supports like organizers and study guides (M = 4.48), and adjusting task complexity based on student needs (M = 4.48)—also received very high ratings. These results suggest that teachers are adept at tailoring content to address individual learning differences in the mathematics classroom.

This high level of knowledge in content differentiation implies that teachers are well-prepared to deliver inclusive and responsive instruction in mathematics. Their ability to modify content and use varied instructional materials supports the development of a learning environment that accommodates students' diverse abilities and readiness levels. This enhances conceptual understanding and promotes equity in mathematics education. However, continued professional development is recommended to deepen their repertoire of strategies and ensure alignment with updated curriculum standards and inclusive practices.

Tomlinson et al. (2021) emphasize that differentiating content based on readiness levels increases engagement and mastery in mathematics. In the Philippine context, David and Torres (2023) found that differentiated instruction significantly enhances conceptual clarity and learning motivation among elementary students. Moreover, Bernardo and Nuqui (2022) highlight the importance of providing varied support tools to scaffold student learning, especially in mixed-ability classrooms.

Statements	Mean	Descriptive Equivalent
I adapt the content of my lessons to accommodate different readiness levels among my students.	**4.57**	**Very High**
I use a variety of materials other than the textbooks provided by the Department of Education.	**4.55**	**Very High**

I clearly articulate the concept of the lessons.	**4.48**	**Very High**
I provide a variety of support mechanisms such as organizers, study guides, and study buddies.	**4.48**	**Very High**
I adjust the complexity of mathematical tasks based on individual students' needs and abilities.	**4.48**	**Very High**
Weighted mean	**4.51**	**Very High**

- Legend:4.20- 5.00Very High`
- 3.40- 4.19 High
- 2.60- 3.39 Moderately High
- 1.80- 2.59 Fairly Low
- 1.00- 1.179 Very Low

Level of knowledge of mathematics teachers on differentiated instruction in terms of process

The findings indicate that mathematics teachers possess a very high level of knowledge in applying differentiated instruction in terms of process, with a weighted mean of 4.56. High ratings were observed in adjusting the pace of instruction (M = 4.58), assessing students' prior knowledge and readiness (M = 4.57), and providing additional support to ensure success (M = 4.56). Teachers also reported very high use of varied strategies and materials (M = 4.53) and offering multiple ways for students to demonstrate understanding (M = 4.54). These results reflect strong teacher capability in customizing the instructional process to meet individual learner needs.

The very high level of knowledge in process differentiation implies that teachers are equipped to create responsive learning environments that adapt to diverse student progress, learning styles, and readiness levels. Their use of pre-assessment, pacing adjustments, and choice in student output supports inclusive education and promotes equitable learning opportunities. Continued training in formative assessment techniques and scaffolding strategies is recommended to sustain and deepen this differentiated practice, especially in large or mixed-ability classrooms.

As stated by Tomlinson and Imbeau (2022), varying instructional methods and pacing strengthens learner motivation and retention. In the local context, Santos and Lim (2023) found that differentiated instructional processes significantly improved mathematics achievement among Filipino students. Additionally, Alido and Corpuz (2021) emphasize the need for ongoing professional development to help teachers refine the application of different instructional strategies.

Statements	**Mean**	**Descriptive Equivalent**
I use a variety of teaching strategies and materials to adapt instruction to individual student needs.	**4.53**	**Very High**
I assess my students' prior knowledge and readiness before introducing new mathematical concepts.	**4.57**	**Very High**
I adjust the pace of instruction based on students' progress and understanding.	**4.58**	**Very High**
I provide additional support as needed to ensure success in mathematics.	**4.56**	**Very High**
I offer choices and options for students to demonstrate their understanding of mathematical concepts.	**4.54**	**Very High**
Weighted mean	**4.56**	**Very High**

- Legend: 4.20- 5.00 Very High`
- 3.40- 4.19 High
- 2.60- 3.39 Moderately High
- 1.80- 2.59 Fairly Low
- 1.179 Very Low

Level of knowledge of mathematics teachers on differentiated instruction in terms of product

The findings indicate that mathematics teachers exhibit a very high level of knowledge in implementing differentiated instruction based on product, with a weighted mean of 4.46. Teachers reported strong use of strategies such as adapting assessment timeframes based on student needs (M = 4.52), providing opportunities for collaboration (M = 4.48), and offering differentiated assessment criteria (M = 4.48). Other practices included soliciting feedback from students about their preferred output formats (M = 4.44) and allowing students to select topics for projects or assignments (M = 4.36). These practices reflect a commitment to providing varied and flexible avenues for students to express mathematical understanding.

By integrating flexibility in task design and assessment timelines, they support personalized learning pathways that can enhance student motivation, autonomy, and academic achievement. These approaches also empower learners to take ownership of their learning and demonstrate

mastery in ways that align with their individual strengths and needs. To maintain and further enrich this practice, institutional support through training on advanced differentiation strategies and development of assessment rubrics tailored to diverse outputs is recommended.

Product differentiation enhances student engagement and achievement by honoring learner preferences in demonstrating understanding. Differentiated assessments encourage creativity and deeper learning when students are given choices in content and format (Reyes & Castro, 2023). Flexible assessment structures have been shown to increase student confidence and reduce performance anxiety in mathematics (Villanueva et al., 2021). Learners benefit most when these assessments are accompanied by clear rubrics and opportunities for peer and self-assessment (De Leon & Bartolome, 2022).

Statements	Mean	Descriptive Equivalent
I allow students to choose from a range of topics or themes when completing mathematical projects or assignments.	**4.36**	**Very High**
I provide opportunities for students to collaborate on mathematical projects or assessments when it aligns with their learning needs.	**4.48**	**Very High**
I offer clear and differentiated criteria for assessing students' work.	**4.48**	**Very High**
I solicit feedback from students on their preferences for how they would like to demonstrate their mathematical understanding.	**4.44**	**Very High**
I adapt assessment timeframes based on students' needs.	**4.52**	**Very High**
Weighted mean	**4.46**	**Very High**

- Legend: 4.20- 5.00 Very High`
- 3.40- 4.19 High
- 2.60- 3.39 Moderately High
- 1.80- 2.59 Fairly Low
- 1.179Very Low

Level of knowledge of mathematics teachers on differentiated instruction in terms of Learning Environment

The data reveal that mathematics teachers demonstrate a very high level of knowledge in implementing differentiated instruction in terms of the learning environment, with a weighted mean of 4.50. Teachers reported arranging physical space to support varied learning activities (M = 4.60), incorporating diverse instructional materials (M = 4.51), and offering flexible seating options (M = 4.51). Other practices included modifying the environment to minimize distractions (M = 4.46) and integrating digital tools to support inclusive learning (M = 4.45). These results reflect a strong commitment to creating adaptive learning spaces that meet the diverse needs of students.

Teachers actively structure their classrooms to support learner variability, which is essential in delivering equitable and responsive instruction. By modifying the physical and digital learning environments, educators enhance engagement, reduce cognitive barriers, and allow students to access content in ways that align with their individual preferences. Continued investment in professional learning and classroom infrastructure can further support teachers in implementing spatial and technological adaptations that foster effective differentiated instruction.

Creating flexible and inclusive learning environments significantly improves student engagement and achievement. Designing physical spaces that support movement, collaboration, and focused work encourages autonomy and participation (Martinez & Yazon, 2021). The use of flexible seating and visual cues helps students self-regulate and choose settings that best support their learning (Torres & Esteban, 2023). Digital tools, when thoughtfully integrated, support differentiated instruction by providing multiple modes of content delivery and interaction (Delgado et al., 2022).

Statements	Mean	Descriptive Equivalent
I arrange the physical classroom space to accommodate various learning activities and student needs.	**4.60**	**Very High**
I incorporate a variety of instructional materials and resources to address the diverse needs of my students.	**4.51**	**Very High**
I modify the classroom environment to reduce distractions and enhance focus for students with different learning preferences.	**4.46**	**Very High**
I provide flexible seating arrangements to allow students to choose the best learning environment for their needs.	**4.51**	**Very High**
I use technology and digital tools to create an inclusive learning environment that supports differentiated instruction.	**4.45**	**Very High**
Weighted mean	**4.50**	**Very High**

- Legend: 4.20- 5.00 Very High`
- 3.40- 4.19 High
- 2.60- 3.39 Moderately High
- 1.80- 2.59 Fairly Low
- 1.179 Very Low

Level of influence of the teachers' profile on differentiated instruction in terms of content

The regression results indicate that the teachers' profile variables—grade level taught, educational qualification, rank, and years of teaching—collectively have a statistically significant but weak influence on their implementation of differentiated instruction in terms of content (p = .032). Among these variables, only years of teaching demonstrated a marginally significant negative effect (B = -0.074, p = .058), suggesting that more experienced teachers may be slightly less inclined to adapt lesson content for diverse learners.

These finding highlights the importance of ongoing professional development regardless of teaching experience, emphasizing that familiarity with differentiated content strategies may diminish over time without targeted training. Institutional support should therefore focus on providing regular, skills-based workshops to maintain teachers' engagement with innovative content differentiation techniques.

Veteran educators may rely on traditional approaches unless provided with updated methodologies aligned with current student needs (Villanueva & Reyes, 2021). Training programs designed for in-service teachers are crucial in enhancing their capacity to adjust content complexity and select appropriate instructional materials (Yap & Dulay, 2022). Furthermore, educational institutions that implement mentorship structures and peer learning communities have been shown to improve content differentiation practices across all career stages (Gonzales & Lim, 2023).

Profile	Coef. B	Std. Error	t - value	Probability
(Constant)	**4.392**	**0.164**	**26.774**	**0.000**
Grade Level Taught	**0.036**	**0.022**	**1.585**	**0.115**
Highest Educational Qualification	**0.085**	**0.053**	**1.591**	**0.114**
Rank	**0.021**	**0.051**	**0.411**	**0.682**
Years of Teaching	**-0.074**	**0.039**	**-1.908**	**0.058***

- Multiple R = 0.065 F - Value = 2.711
- Probability = 0.032 = Significant at 1%
- = Significant at 5%

Level of influence of the teachers' profile on differentiated instruction in terms of process

The regression analysis reveals a statistically significant relationship between teachers' profiles and their implementation of differentiated instruction in terms of process (p = .001). Notably, the highest educational qualification significantly predicts differentiated instruction practices (B = 0.175, p = .001), suggesting that teachers with advanced academic credentials are more likely to apply varied instructional processes to meet student needs.

This may be attributed to their deeper exposure to research-based practices and pedagogical frameworks gained through postgraduate studies. Although other factors such as grade level taught, rank, and years of teaching did not yield significant results, the overall model indicates that teachers' academic preparation plays a pivotal role in shaping their ability to adapt instruction. These findings underscore the need to strengthen teacher education programs and encourage continuous academic advancement to improve instructional differentiation in the classroom.

Ganal and Tagayuna (2021) found that postgraduate studies enhanced teachers' ability to diagnose learning needs and implement targeted interventions. Lozano et al. (2023) emphasized that graduate-level coursework exposes educators to inclusive pedagogies, which are essential for differentiated instruction. Meanwhile, Del Rosario and Bagayas (2024) highlighted that professional growth through higher education directly correlates with the application of learner-centered practices, particularly in adapting the instructional process to address diverse learning profiles.

Profile	**Coef. B**	**Std. Error**	**t - value**	**Probability**
(Constant)	**4.257**	**0.161**	**26.411**	**0.000**
Grade Level Taught	**0.028**	**0.022**	**1.284**	**0.201**
Highest Educational Qualification	**0.175**	**0.052**	**3.344**	**0.001****
Rank	**0.012**	**0.051**	**0.230**	**0.818**
Years of Teaching	**-0.068**	**0.038**	**-1.790**	**0.075**

- Multiple R = 0.116F - Value = 5.100
- Probability = 0.001 = Significant at 1%
  = Significant at 5%

Level of influence of the teachers' profile on differentiated instruction in terms of product

The regression analysis shows that both the grade level taught (B = 0.072, p = .001) and highest educational qualification (B = 0.138, p = .005) significantly influence mathematics teachers' use of differentiated instruction in terms of product. These findings suggest that teachers who teach higher grade levels and those with advanced academic qualifications are more likely to design varied assessment products tailored to students' needs, interests, and learning profiles. This highlights the importance of specialized training and experience in implementing student-centered assessment strategies. Meanwhile, teacher rank and years of teaching did not significantly predict differentiated practices in this domain. Schools and training institutions should therefore prioritize professional development on designing flexible assessment outputs, particularly targeting teachers in lower grades and those with fewer academic credentials.

Medina et al. (2021) demonstrated that teachers at higher educational levels often develop more complex assessment alternatives, such as project-based tasks and performance outputs. Ramos and Enriquez (2023) revealed that postgraduate-educated teachers are more adept at customizing assessments, integrating rubrics, and accommodating varied learning outcomes. Furthermore, Valenzuela and Ponce (2024) reported that teachers with formal training in assessment literacy are more effective in offering differentiated tasks that foster creativity and critical thinking.

Profile	Coef. B	Std. Error	t - value	Probability
(Constant)	**4.095**	**0.150**	**27.285**	**0.000**
Grade Level Taught	**0.072**	**0.021**	**3.506**	**0.001****
Highest Educational Qualification	**0.138**	**0.049**	**2.820**	**0.005****
Rank	**0.001**	**0.047**	**0.026**	**0.980**
Years of Teaching	**-0.061**	**0.035**	**-1.733**	**0.085**

- Multiple R = 0.143 F - Value = 6.522
- Probability = 0.000** ** = Significant at 1%
  = Significant at 5%

Level of influence of the teachers' profile on differentiated instruction in terms of learning environment

The regression results indicate that among the teacher profile variables, only years of teaching significantly influenced their implementation of differentiated instruction in terms of learning environment (B = -0.120, p = 0.051), although the effect is negative and marginal. This suggests that less experienced teachers may be more inclined to adopt innovative, flexible learning environments that accommodate diverse student needs. Conversely, those with more years in service might adhere to traditional classroom setups, possibly due to ingrained routines or limited exposure to updated pedagogical strategies. Given this, educational institutions should support veteran teachers with targeted professional development that promotes adaptive classroom design and inclusive learning spaces, especially as differentiated instruction becomes increasingly central to modern teaching standards.

Llaguno and Villanueva (2022) report that early-career teachers are more responsive to training on differentiated learning environments due to their openness to change and digital fluency. Meanwhile, Cruz and Tadena (2023) found that professional experience does not always correlate with instructional adaptability, particularly in managing physical or virtual learning environments. Furthermore, Bautista et al. (2021) emphasize the importance of continuous environmental design training to help all teachers, regardless of tenure, create learner-centered and distraction-reducing spaces that support diverse learning needs.

Profile	Coef. B	Std. Error	t - value	Probability
(Constant)	**4.555**	**0.260**	**17.513**	**0.000**
Grade Level Taught	**0.016**	**0.036**	**0.440**	**0.660**
Highest Educational Qualification	**0.145**	**0.085**	**1.712**	**0.089**
Rank	**0.005**	**0.082**	**0.063**	**0.950**
Years of Teaching	**-0.120**	**0.061**	**-1.969**	**0.051***

- Multiple R = 0.062 F - Value = 2.578
- Probability = 0.040 ** = Significant at 1%
  = Significant at 5%

Phase 2

Assessment of learners' needs and learning styles

Identifying Learner Needs and Styles. Understanding the diverse needs and learning styles of students is essential in differentiated instruction. Teachers use diagnostic tools, simple tasks, and observation to assess students' readiness levels. These insights allow educators to design math instruction that aligns with varying abilities and learning profiles.

Identifying students' strengths and areas for growth is a crucial first step in planning effective and inclusive instruction. It involves using varied methods to understand how learners engage with tasks and their peers. As stated:

I test their ability by using simple problem task, games, and observing how students interact with their peers. With these I can plan and create well diverse lessons and activities to meet their learning needs. (Informant 1 RQ1.a L 1–5)

Understanding students' individual differences is foundational to differentiated instruction. Teachers must employ a variety of strategies to accurately gauge learning profiles. As noted:

Identifying the diverse learning needs and abilities of students when planning math lessons requires a multi-faceted approach combining various assessment methods and ongoing observation. (Informant 2 RQ1.a L 21–25)

Gaining insight into students' prior knowledge allows teachers to tailor instruction based on readiness levels. This is often achieved through brief diagnostics and questioning. As shared:

To identify the diverse learning needs and abilities of students by having a diagnostic using short tests or asking simple questions to get their prior knowledge about the lesson. (Informant 3 RQ1.a L 51–55)

Literature emphasizes the effectiveness of differentiated assessments to promote learning inclusivity. Tomlinson and Murphy (2020) note that readiness assessments foster targeted teaching, allowing students to access content aligned with their cognitive level. Similarly, Castillo and Paredes (2023) found that early assessments such as diagnostic tests improve instructional planning and student engagement. Likewise, Nguyen and Ramos (2021) emphasized that consistent learner profiling helps refine differentiated strategies, improving both engagement and retention in math education.

Table 1

Themes on assessment of learners' needs and learning styles

Global Theme	Organizing Theme	Basic Theme
Inclusive and Needs-Based Mathematics Instruction	**Assessment of Learning Styles and Needs**	**Readiness assessment and learner profiling**

Strategies and tools for differentiated instruction

Instructional Strategies and Tools. Mathematics teachers use a range of strategies and tools to implement differentiated instruction effectively. These include manipulatives, visual aids, real-world materials, and adaptive technology tailored to diverse learning styles. Such approaches help bridge learning gaps and promote deeper conceptual understanding.

Differentiating instruction according to students' learning styles helps ensure that mathematical concepts are accessible and engaging for all learners. As explained:

Solving routine problems like finding the volume of a cube. For visual learners, I use bars, pie graphs; for logical-mathematical thinkers, I use problem-solving tasks with puzzles. (Informant 1 RQ1.b L 6–14)

Effective mathematics instruction requires adaptability in both content and delivery to meet the diverse needs of learners. As noted:

Let's consider teaching the concept of solving equations. Pre-assessment, content differentiation, process and product differentiation... The key is flexibility and adapting the lesson based on real-time student responses. (Informant 2 RQ1.b L 26–39)

Technology integration plays a vital role in differentiated instruction by providing adaptive tools that cater to varying skill levels. As mentioned:

Adaptive technology can be used in any mathematical concepts. Online math games depending on the level of difficulty. (Informant 3 RQ1.b L 56–65)

Research supports the use of diverse tools in delivering differentiated instruction. Landrum and McDuffie (2021) emphasized the importance of using content, process, and product differentiation to ensure access to learning. Martinez and Sotto (2024) reported that technology-enhanced instruction increased learner motivation and conceptual understanding, especially in numeracy and geometry. In addition, Rivera and Lumibao (2022) found that the integration of real-world materials improved conceptual understanding among Filipino learners.

Table 2

Themes strategies and tools for differentiated instruction

Global Theme	Organizing Theme	Basic Theme
Inclusive and Needs-Based Mathematics Instruction	**Strategies and Tools for Differentiation**	**Use of manipulatives, visual aids, and adaptive tech**

Support for struggling learners

Targeted Interventions for Struggling Learners. Teachers adopt specific instructional interventions to support students who face challenges in mathematics. Strategies such as scaffolding, peer tutoring, explicit teaching, and technology integration help simplify complex tasks. These approaches aim to build learners' confidence and improve their understanding of mathematical concepts.

Targeted instructional strategies, such as explicit teaching, help simplify complex tasks and make mathematical concepts more accessible for struggling learners. As shared:

I can use explicit problem solving by using series of operations. (Informant 1 RQ1.c L 15–20)

Supporting struggling learners requires a holistic approach that addresses both academic and emotional needs through proactive strategies. As noted:

Some key strategies are building a positive learning environment, addressing foundational gaps. and collaboration and communication. (Informant 2 RQ1.c L 40–50)

Instructional scaffolding and hands-on activities are effective approaches to support learners in understanding complex mathematical concepts. As expressed:

I always use scaffolding. Breaking more complex concepts into simpler ones. Hands-on learning can engage students and cater to different learning styles. (Informant 3 RQ1.c L 66–73)

Literature shows that scaffolded and interactive learning enhances comprehension among struggling learners. Yu and Tabuena (2023) highlight how task breakdown and visual aids improve engagement and cognitive processing. Reyes and Dela Cruz (2022) emphasized collaborative efforts between teachers and parents to extend learning support at home. Furthermore, Mendoza and Chan (2020) argued that consistent scaffolding boosts confidence in solving multi-step math problems among struggling students.

Table 3

Themes on support for struggling learners

Global Theme	Organizing Theme	Basic Theme
Supportive Learning Environment	**Support for Struggling Learners**	**Scaffolding, tutoring, and home-school collaboration**

Impact on student confidence and mastery

Differentiated Instruction and Learner Growth. Differentiated instruction fosters increased motivation, confidence, and conceptual mastery among learners. It allows students to engage at their own pace and through their preferred learning styles. This approach creates a positive and supportive learning environment that promotes academic success.

Differentiated instruction enhances students' self-confidence by allowing them to engage with content in ways that suit their learning preferences. As stated:

Using differentiated instruction boosts the confidence of the pupils. Giving multiple ways enabling them to understand the concepts. (Informant 1 RQ2.b L 11–20)

When students experience instruction tailored to their needs, they tend to show higher motivation and perseverance. As described:

Increased motivation, improved confidence, greater persistence. (Informant 2 RQ2.b L 41–55)

Personalized learning approaches can lead to notable improvements in student engagement, especially among those who previously struggled with mathematics. As observed:

Students who previously struggled in math often showed increased engagement and willingness to participate. (Informant 3 RQ2.b L 76–87)

Studies confirm that differentiated instruction increases student engagement and achievement. Velasco and Santos (2021) reported that students exposed to personalized learning tasks displayed higher math performance. Pascua et al. (2025) found that student confidence, enhanced through goal-setting and personalized instruction, directly contributes to mastery and academic resilience. Supporting this, Ignacio and Bautista (2022) noted that differentiated instruction boosts learners' perseverance and improves math performance over time.

Table 4

Themes on impact of student confidence and mastery

Global Theme	Organizing Theme	Basic Theme
Empowered and Motivated Learners	**Impact on Confidence and Mastery**	**Improved motivation, engagement, and self-efficacy**

CHAPTER V SUMMARY, CONCLUSIONS, AND RECOMMENDATION

This chapter presents the summary of the findings, conclusions drawn from the results, and recommendations based on the data gathered in the study. The study explored the level of knowledge and implementation of differentiated instruction among mathematics teachers and examined how their professional profiles influenced this practice.

Summary of Findings

This section outlines the significant findings derived from both quantitative and qualitative phases of the study on differentiated instruction among mathematics teachers.

- The study found that the 161 mathematics teachers were fairly distributed across grade levels, predominantly held master's qualifications, mostly occupied Teacher I-III ranks, and represented a balanced mix of early-career and highly experienced educators.
- Mathematics teachers demonstrated a very high level of knowledge and application of differentiated instruction across all four domains: content, process, product, and learning environment.
- The regression analyses revealed that among teacher profile variables, educational qualification significantly influenced differentiated instruction in terms of process and product, while grade level taught also significantly affected product differentiation; meanwhile, years of teaching showed a marginal negative effect on content and learning environment, indicating that less experienced teachers may be more inclined toward flexible and responsive instructional practices.
- Mathematics teachers assess learner needs through readiness assessments, diagnostic tasks, and observation, enabling them to design math lessons that align with diverse abilities and learning styles.
- Teachers employ a variety of instructional strategies and tools such as manipulatives, visual aids, real-world materials, and adaptive technology to meet students' learning styles and promote deeper understanding.
- Teachers implement targeted interventions like scaffolding, peer tutoring, hands-on activities, and explicit teaching to simplify tasks and provide additional support for struggling learners in mathematics.
- Differentiated instruction fosters increased motivation, engagement, and confidence among learners, leading to improved participation and higher levels of conceptual mastery in mathematics.

Conclusions

This section presents the conclusions drawn from the key findings of the study. Based on the analysis of both quantitative and qualitative data, the conclusions highlight the extent of mathematics teachers' knowledge and practices in implementing differentiated instruction, the influence of their professional profiles, and the effectiveness of their strategies in addressing diverse learner needs.

- The profile of mathematics teachers demonstrates a well-qualified and experienced workforce, with many holding master's degrees and occupying key teaching positions. The presence of both novice and seasoned teachers presents a valuable opportunity for peer collaboration and mentoring that can support professional growth and instructional quality.
- The consistently very high ratings across the content, process, product, and learning environment domains confirm that mathematics teachers possess a strong understanding and application of differentiated instruction. This reflects their preparedness to address diverse learner needs and suggests an instructional culture that embraces inclusivity and responsiveness.
- The significant influence of educational qualification and grade level taught on specific domains of differentiated instruction highlights the value of advanced academic training and grade-specific expertise. Meanwhile, the marginal negative impact of teaching experience suggests that newer teachers may be more open to innovative practices, emphasizing the need for continuous training and re-skilling for veteran educators.
- The use of diverse and adaptive instructional materials—including manipulatives, visual aids, and technology—demonstrates teachers' commitment to delivering differentiated instruction that engages students meaningfully. These practices support the development of mathematical understanding through multimodal learning experiences.
- By implementing scaffolding, tutoring, and tailored instruction, teachers effectively provide struggling students with targeted support that promotes academic progress and builds confidence. These interventions are critical in ensuring that all learners are given fair opportunities to succeed in mathematics.
- The integration of differentiated instruction positively influences students' self-efficacy, motivation, and academic performance. When instruction is tailored to individual needs, students demonstrate increased engagement and persistence, leading to enhanced mastery of mathematical concepts and overall classroom success.

Recommendations

Based on the major findings and conclusions of this study, the following recommendations are proposed to enhance the implementation of differentiated instruction in mathematics.

- Schools and educational authorities should strengthen mentoring systems by pairing early-career teachers with experienced educators to foster professional learning communities. Furthermore, institutional support should be provided for teachers aiming to pursue graduate or doctoral studies through scholarships and study leaves to encourage upward mobility in the profession.
- To sustain the very high level of differentiated instruction, professional development programs should be offered regularly, focusing on emerging pedagogical approaches, inclusive practices, and updated curriculum standards. Training should also include workshops that promote innovation in content delivery, process design, assessment strategies, and learning environment adaptations.
- Educational leaders should prioritize continuing education for all teachers, especially those with less exposure to formal academic advancement. Specific interventions such as differentiated instruction certification programs, research-based pedagogy workshops, and structured lesson study cycles should be implemented to address the gaps influenced by experience, qualification, or teaching level.

- Schools should institutionalize the use of diagnostic tools and learner profiling at the start of each academic year. Training teachers in the interpretation of assessment data and observation techniques will further improve lesson planning and ensure that instruction is aligned with the diverse cognitive and emotional needs of students.

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