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Competencies and Instructional Practices of Mathematics Teachers in Differentiated Instruction: A Descriptive–Comparative Study in Bagamanoc Districts, Philippines

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Abstract

In the Bagamanoc North and South Districts, public elementary mathematics teachers are increasingly tasked with addressing diverse learner needs amid persistent disparities in readiness, engagement, and access to instructional resources, and although differentiated instruction is formally encouraged, its classroom implementation remains uneven, particularly in adaptive assessment and technology-supported practices, underscoring the need for localized empirical evidence to inform targeted professional support; grounded in Tomlinson's Differentiated Instruction Theory and Shulman's Pedagogical Content Knowledge framework, this descriptive–comparative quantitative study examined the competencies and instructional practices of 83 public elementary mathematics teachers during School Year 2025–2026 and analyzed differences based on age, sex, educational attainment, teaching experience, and relevant trainings using a validated and reliable researcher-developed questionnaire (α = 0.859), with data analyzed through descriptive statistics (frequency, percentage, and weighted mean) and inferential tests (t-test and one-way ANOVA with post hoc analysis). Results indicated that teachers were highly competent overall (WM = 3.78, SD= 0.42)), demonstrating strongest performance in student engagement (WM = 3.86, SD= 0.34) and comparatively lower levels in assessment and adaptation (WM = 3.72, SD= 0.46), while instructional practices were rated highly effective (WM = 3.61, SD= 0.50), with technology integration emerging as the least emphasized domain. Significant differences in both competencies and practices were found across age, educational attainment, teaching experience, and participation in differentiated instruction trainings, whereas sex showed no significant influence, highlighting the pivotal role of professional learning and experience in translating differentiated instruction competencies into consistent classroom practice. These findings point to the necessity of a targeted, evidence-based action plan that prioritizes adaptive assessment and technology integration to strengthen differentiated mathematics instruction and advance Sustainable Development Goal 4 on inclusive and equitable quality education.

Keywords: teacher competence, inclusive pedagogy, professional development, classroom adaptation, educational equity

INTRODUCTION

Differentiated instruction (DI) has gained international recognition as a pedagogical response to increasing learner diversity, particularly in mathematics education where persistent disparities in readiness, engagement, and achievement continue to challenge equitable learning outcomes (Deunk et al., 2018). Anchored in principles of inclusive and equity-oriented teaching, DI emphasizes intentional adjustments in content, instructional processes, and assessment practices to address learners' varied readiness levels, interests, and learning profiles, thereby positioning teacher competence as a central factor in effective classroom implementation (Smale-Jacobse et al., 2019). While empirical studies consistently affirm the potential of DI to enhance learning opportunities in mathematics, its effectiveness remains strongly dependent on teachers' preparedness, pedagogical

expertise, and capacity to adapt instruction and assessment to diverse learners.

Extant literature indicates that teachers' instructional practices in differentiated instruction are significantly influenced by profile variables such as age, educational attainment, years of teaching experience, and participation in relevant professional development activities, highlighting the importance of examining these characteristics as sources of instructional variation (Chan & Yung, 2018a). Moreover, research suggests that demonstrated competencies, particularly in strategy mastery, student engagement, and adaptive assessment, do not consistently translate into sustained classroom practice, pointing to a persistent disconnect between theoretical knowledge and instructional enactment in DI (Pozas & Schneider, 2019). In developing country contexts, including the Philippines, investigations on DI have largely emphasized general teaching effectiveness, with limited attention given to subject specific applications, localized settings, and comparative analyses across school districts (Cabigao, 2021).

Notably, there remains a paucity of localized descriptive and comparative studies that concurrently examine mathematics teachers' competencies and instructional practices in differentiated instruction while accounting for differences based on demographic and professional profiles, particularly in rural and island school divisions such as Bagamanoc (Smale-Jacobse et al., 2019). This study directly addresses this gap by systematically analyzing the intersection between teachers' competencies and their reported instructional practices and by determining whether significant variations exist across selected profile variables. The findings are intended to serve as an empirical foundation for a targeted action plan that aligns professional development initiatives, instructional support mechanisms, and monitoring strategies with identified areas for improvement (Deunk et al., 2018).

Consistent with Sustainable Development Goal 4, which emphasizes inclusive and equitable quality education, this research contributes to global efforts to strengthen teacher capacity as a strategic lever for improving mathematics instruction in diverse and resource constrained learning environments (UNESCO, 2021). Through its localized yet internationally informed perspective, the study advances evidence-based policy and practice in differentiated mathematics instruction.

Statement of the Problem. This study aimed to assess the competencies and instructional practices of mathematics teachers in differentiated instruction and examine differences based on selected profile variables in the Bagamanoc North and South Districts. Specifically, it sought to answer the following research questions:

1. What is the profile of Mathematics teachers in Bagamanoc North and South Districts in terms of:
   1.1 Age;
   1.2 Sex;
   1.3 Educational Attainment;
   1.4 Years of Teaching Experience; and
   1.5 Relevant Trainings and Workshops on Differentiated Instruction?

2. What are the competencies of Mathematics teachers in differentiated instruction in terms of:
   2.1 Readiness and Preparation;
   2.2 Mastery of Strategies;
   2.3 Student Engagement; and
   2.4 Assessment and Adaptation?

3. What are the practices employed by Mathematics teachers in differentiated instruction in terms of:
   2.1 Varied Teaching Strategies;
   2.2 Instructional Adaptation;
   2.3 Technology Integration; and
   2.4 Assessment and Feedback?

4. Is there a significant difference in the competencies of Mathematics teachers in

differentiated instruction when grouped according to their profile variables?

5. Is there a significant difference in the practices employed by Mathematics teachers in differentiated instruction when grouped according to their profile variables?

6. What action plan can be proposed to enhance the competencies and practices in differentiated instruction of teachers in Mathematics in Bagamanoc North and South Districts?

Null Hypotheses. The following null hypotheses were tested at a 0.05 level of significance:

H_{01}. There is no significant difference in the competencies of Mathematics teachers in differentiated instruction when grouped according to their profile variables.

H_{02}. There is no significant difference in the instructional practices employed by Mathematics teachers in differentiated instruction when grouped according to their profile variables.

Scope of the Study. This study examined the competencies and instructional practices of public elementary Mathematics teachers implementing differentiated instruction in the Bagamanoc North and South Districts during School Year 2025–2026. Specifically, it focused on teachers' competencies in terms of readiness, preparation, and mastery of differentiated instructional strategies, as well as their classroom practices, including instructional adaptation, assessment, and feedback mechanisms. Data were gathered through self-reported survey instruments to capture teachers' perceptions and experiences in applying differentiated instruction. The scope of the study was confined to public elementary schools within the specified districts. It excluded private schools, other subject areas, and direct measurements of student academic performance, thereby ensuring a focused examination of teacher-related variables within the defined educational context.

Theoretical and Conceptual Framework. This study is grounded in Tomlinson's Differentiated Instruction (DI) Theory, which provides a comprehensive lens for examining mathematics teachers' competencies and instructional practices by emphasizing purposeful adjustments to content, process, and assessment based on learners' readiness, interests, and learning profiles (Deunk et al., 2018). Recent empirical evidence affirms the effectiveness of DI in mathematics education, highlighting that teachers' readiness and preparation, mastery of differentiated strategies, active student engagement, and adaptive assessment practices are critical to fostering inclusive and equitable learning environments (Smale-Jacobse et al., 2019). These dimensions directly inform the competency and practice indicators assessed in the present study.

The framework is further strengthened by Shulman's (1987) Pedagogical Content Knowledge (PCK) Theory, which explains how teachers' subject matter knowledge, pedagogical skills, and contextual understanding interact to guide instructional decision-making in mathematics classrooms (Depaepe et al., 2016). Contemporary studies demonstrate that variations in PCK, often shaped by teachers' educational attainment, professional experience, and training, significantly influence how differentiated instruction is implemented in practice (Chan & Yung, 2018).

Integrating these theories, the conceptual model positions teachers' profile variables as grouping factors that may account for differences in competencies and instructional practices in differentiated instruction. The inclusion of localized settings is theoretically significant because, as Cabigao (2021) notes, Philippine classrooms face unique systemic challenges, such as large class sizes and resource limitations, that necessitate a culturally and contextually responsive application of DI. Furthermore, centering this investigation in a rural island division like Catanduanes aligns with recent regional

evidence from Cordial, Valledor, and Bermudo (2025), which highlights that the success of specialized mathematics interventions is deeply contingent upon the specific instructional leadership and localized implementation strategies within the district. The descriptive-comparative linkage underscores the systematic analysis of group-based variations, while the findings provide an empirical basis for formulating an evidence-based action plan to enhance differentiated mathematics instruction tailored to the unique demographic and professional landscape of the Bagamanoc districts.

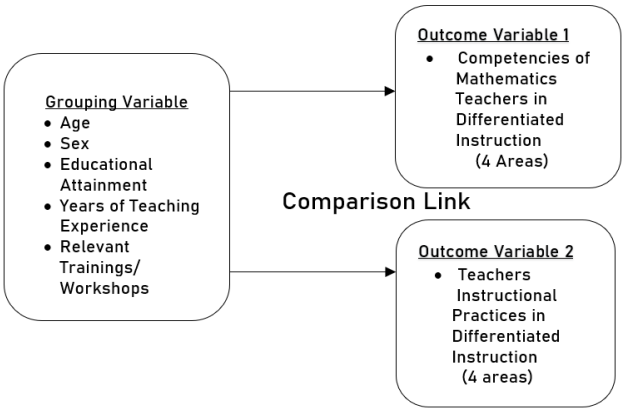

Figure 1
Grouping-Outcome Model illustrating the comparison of teacher competencies and practices based on profile variables.

LITERATURE REVIEW

The literature reviewed for this study examines mathematics teachers' competencies and instructional practices in differentiated instruction (DI), synthesizing recent empirical and theoretical studies to capture global trends alongside localized educational realities. Organized thematically, the discussion integrates findings related to teacher profile variables, instructional competencies, and classroom practices to illuminate how contextual, professional, and leadership factors collectively shape differentiated mathematics instruction. This synthesis firmly establishes the empirical foundation underpinning the present study, while simultaneously guiding its comparative orientation and shaping its action-oriented, practical outcomes.

Teacher Profile Variables and Differentiated Instruction Capacity. Teacher demographic and professional profile variables play a significant role in shaping competencies and instructional practices in differentiated instruction, particularly in mathematics education where learner variability is pronounced (Deunk et al., 2018; Smale-Jacobse et al., 2019). Educational attainment and years of teaching experience have been shown to influence instructional confidence, pedagogical flexibility, and teachers' ability to respond to diverse learner needs (Chan & Yung, 2018; Depaepe et al., 2016). Teachers with advanced academic preparation and sustained engagement in professional development demonstrate stronger alignment with differentiated instructional principles, especially in content modification and assessment responsiveness (Smit & Humpert, 2019; Van Geel et al., 2019).

Within the Philippine context, particularly in Catanduanes, Cordial, Amaranto, and Bermudo (2025) emphasize that teacher professionalism, ethical standards, and continuous training are integral to instructional quality, reinforcing the importance of relevant trainings and workshops as a defining profile variable. Their findings suggest that local professional standards frameworks influence teachers' readiness to adopt learner-centered and differentiated practices, thereby contextualizing international findings within provincial educational realities. Moreover, targeted DI-related trainings significantly enhance teachers' instructional readiness and strategic competence, indicating that professional learning mediates the relationship between teacher profile characteristics and classroom enactment of differentiation (Pozas et al., 2020). These converging findings substantiate the present study's emphasis on profile-based comparisons of competencies and practices.

Competencies in Differentiated Mathematics Instruction. Competency in differentiated instruction is inherently multidimensional, encompassing readiness and preparation, mastery of instructional strategies, facilitation of student engagement, and adaptive

assessment practices (Tomlinson, 2017; Smale-Jacobse et al., 2019). Research consistently indicates that while mathematics teachers often demonstrate foundational readiness for differentiation, substantial variability exists in strategy mastery and assessment adaptation, particularly in heterogeneous classrooms (Deunk et al., 2018; Suprayogi et al., 2017). Teachers who effectively differentiate mathematics instruction exhibit strong pedagogical content knowledge (PCK), enabling them to align mathematical tasks, representations, and scaffolding strategies with learners' cognitive readiness and learning profiles (Depaepe et al., 2016; Chan & Yung, 2018).

However, persistent gaps are noted in formative assessment use and real-time instructional adjustment, which are essential for sustaining learner engagement and monitoring learning progression (Van Geel et al., 2019; Smit & Humpert, 2019). These competency gaps underscore the need for instructional leadership that supports teachers in refining assessment-driven decision-making. Cordial, Tabuzo, and Bermudo (2025) highlight that instructional leadership practices of school heads, such as mentoring, supervision, and professional learning facilitation, play a crucial role in strengthening teachers' instructional competencies, even though their study focused on school leaders. Their findings reinforce the notion that teacher competence in DI is not developed in isolation but is influenced by the instructional ecosystem within schools. Synthesizing these perspectives affirms the importance of examining competency dimensions separately while recognizing their interdependence, as operationalized in the present study.

Instructional Practices in Differentiated Mathematics Classrooms. Instructional practices represent the observable enactment of teachers' competencies and their capacity to translate differentiated instruction theory into classroom action (Pozas et al., 2020). Empirical studies identify varied teaching strategies, including flexible grouping, tiered tasks, and multiple representations, as central to effective DI in mathematics, although these practices are applied inconsistently across educational contexts (Deunk et al., 2018; Smale-Jacobse et al., 2019). Instructional adaptation, particularly in pacing and task complexity, is strongly associated with teaching experience and prior exposure to DI-focused professional development (Van Geel et al., 2019; Suprayogi et al., 2017).

Technology integration further extends differentiated practices by enabling personalized learning pathways, immediate feedback, and multimodal representation of mathematical concepts, yet its classroom application remains uneven, especially in resource-constrained settings (Smit & Humpert, 2019). In Catanduanes, Cordial, Evangelista, and Bermudo (2025) found that primary teachers' technology integration practices are influenced by access, training, and instructional support, highlighting both the potential and limitations of digital tools in localized contexts. Their findings directly inform the present study's focus on technology integration as a distinct instructional practice domain, emphasizing the need to examine how technological competence intersects with differentiated instruction in mathematics classrooms. Collectively, these studies indicate that instructional practices are shaped by the interaction of teacher capacity, contextual resources, and institutional support.

Profile-Based Variations and the Need for Action-Oriented Interventions. Comparative studies consistently reveal significant differences in differentiated instruction competencies and practices when teachers are grouped according to age, teaching experience, educational attainment, and exposure to professional development (Chan & Yung, 2018; Pozas et al., 2020). Teachers with sustained and relevant professional learning opportunities demonstrate more coherent integration of assessment and feedback into differentiated mathematics instruction, resulting in more responsive and inclusive classroom environments (Van Geel et al., 2019; Smale-

Jacobse et al., 2019). These variations underscore the limitations of generic professional development models and point to the necessity of context-specific, data-driven action plans that directly address identified instructional gaps (Tomlinson, 2017).

Synthesizing the international and local literature, it becomes evident that evidence-based action planning functions as a critical bridge between research findings and instructional improvement. The present study builds on this synthesis by providing localized empirical evidence from Bagamanoc North and South Districts to inform a targeted action plan aimed at enhancing teachers' competencies and instructional practices in differentiated mathematics instruction.

METHODS

Research Design. This quantitative study utilized a descriptive–comparative research design to examine the competencies and instructional practices of mathematics teachers in differentiated instruction and to determine variations based on selected profile variables. The descriptive component was appropriate for identifying and describing existing levels of teachers' competencies and classroom practices without manipulating variables, allowing objective measurement through structured instruments and statistical procedures (Creswell & Creswell, 2018). The comparative component enabled the analysis of significant differences in competencies and practices when teachers were grouped according to age, sex, educational attainment, teaching experience, and relevant training (Salkind, 2017). This combined approach is widely used in educational research to explain instructional variations across teacher characteristics and to generate evidence-based inputs for developing an action plan to strengthen differentiated mathematics instruction (Cohen et al., 2018).

Population, Samples and Sampling Technique. The population of the study consisted of all public elementary Mathematics teachers in the Bagamanoc North and South Districts, totaling 105 teachers across 13 schools. To ensure adequate representation while maintaining feasibility, a sample of 83 teachers was determined using Slovin's formula, which is appropriate for finite populations when the level of precision is specified, and population variability is unknown (Salkind, 2017). This approach is widely used in descriptive–comparative educational research to obtain reliable estimates while minimizing sampling bias (Cohen et al., 2018). Proportionate sampling was applied at the school level to ensure that each institution was fairly represented relative to its population size, enhancing the external validity of the findings (Creswell & Creswell, 2018). By covering approximately 79% of the total population, the sample size was sufficient to support robust statistical comparisons of competencies and instructional practices across teacher profile variables, thereby strengthening the generalizability and analytical rigor of the study.

Instrumentation. A researcher-developed questionnaire was utilized to systematically examine mathematics teachers' competencies and classroom practices in differentiated instruction (DI) in the Bagamanoc North and South Districts. The instrument comprised three analytically distinct domains: (a) teacher profile variables; (b) DI competencies; and (c) DI practices. To ensure the tool was contextually relevant to the specific instructional environment of the Division of Catanduanes, the development process mirrored the localized validation protocols established by Cordial, Evangelista, and Bermudo (2025) and Cordial, Valledor, and Bermudo (2025). Specifically, the items were aligned with the Mathematics assessment standards and technological integration practices prevalent in the province to enhance content validity. To operationalize responses, a structured four-point Likert-type scoring rubric was employed. Teachers' competencies were rated from 1 (Least Competent) to 4 (Highly Competent), while instructional practices were evaluated using parallel descriptors ranging from Least Effective to Highly Effective, with clearly defined

numerical intervals to ensure consistency and interpretive clarity. The use of a four-point scale minimized central tendency bias and enhanced discrimination among response levels (DeVellis, 2017). Content and face validity were established through expert judgment by four specialists in mathematics education and DI, who assessed item relevance, clarity, and construct alignment (Boateng et al., 2018). Reliability was examined through internal consistency using Cronbach's alpha derived from inter-item correlations, appropriate for single-administration instruments (Taber, 2018). The resulting coefficient (α = 0.859) indicates high reliability, supporting robust quantitative and inferential analyses.

Data Analysis. Data were analyzed using appropriate descriptive and inferential statistical techniques consistent with quantitative educational research. Frequency count and percentage were used to describe the respondents' demographic profile in terms of age, sex, educational attainment, teaching experience, and relevant training. Weighted mean and standard deviation were computed to determine the overall level and variability of mathematics teachers' competencies and instructional practices in differentiated instruction (DI). For inferential analysis, the t-test for independent samples was applied to examine significant differences across binary variables, while one-way analysis of variance (ANOVA/F-test) was employed to determine variations among multiple groups. Responses were operationalized using a structured four-point Likert-type scoring rubric, where competencies were rated from 1 (Least Competent) to 4 (Highly Competent), and instructional practices ranged from Least Effective to Highly Effective. The use of this scale enhanced measurement sensitivity and reduced central tendency bias, supporting meaningful statistical interpretation (Creswell & Creswell, 2018).

Ethical Considerations. Ethical approval was secured from relevant authorities, and informed consent was obtained from all participants, ensuring voluntary participation, anonymity, and the right to withdraw without penalty. Data confidentiality was upheld through anonymized coding, password-protected digital storage, and restricted access limited to the researchers. Hard copies were securely stored and scheduled for proper disposal via shredding, while electronic data will be permanently deleted after a defined retention period, in accordance with data protection standards (Creswell & Creswell, 2018). Potential design limitations, including self-report bias, the cross-sectional nature of the study, and context specificity, were acknowledged as constraints on causal inference and generalizability (Cohen et al., 2018). Despite these limitations, findings offer actionable evidence to inform targeted professional development and policy recommendations supporting differentiated instruction in mathematics education.

RESULTS

This section presents a comprehensive analysis of the findings from the study, focusing on the demographic and professional profiles, competencies, and instructional practices of mathematics teachers in Bagamanoc North and South Districts, as well as the differences observed across selected profile variables. The discussion highlights the patterns, trends, and implications of these findings in the context of differentiated instruction, providing a foundation for the development of a strategic action plan to enhance teacher competencies and instructional effectiveness.

Demographic and Professional Profile of Mathematics Teachers. Table 1 presents the demographic profile of mathematics teachers in Bagamanoc North and South Districts, revealing a predominance of mid-career educators, with the largest proportion (38.56%) aged 36–45 years, suggesting a stable workforce with substantial teaching experience. Female teachers constituted the majority (78.31%), reflecting local gender trends in the teaching profession. Most teachers hold master's units (77.11%), demonstrating ongoing professional development, while fewer have completed master's or doctoral degrees,

highlighting opportunities for advanced qualification support. In terms of teaching experience, the majority have served over ten years (55.42%), suggesting well-established pedagogical practices. Participation in differentiated instruction trainings is relatively high, with 42.17% attending three to five workshops, underscoring institutional emphasis on continuous professional growth. Collectively, these patterns indicate that teachers are experienced, academically prepared, and engaged in ongoing learning, factors that likely enhance their capacity to implement differentiated instruction effectively, although doctoral-level representation remains limited.

Table 1

Demographic and Professional Profile of Mathematics Teachers in Bagamanoc North and South Districts (n = 83)

Profile Variable	Category	f	%
Age (years)	26–35	23	27.71
	36–45	32	38.56
	46–55	21	25.30
	56 and above	7	8.43
Sex	Male	18	21.69
	Female	65	78.31
Educational Attainment	Bachelor's Graduate	11	13.25
	Master's Unit	64	77.11
	Master's Graduate	7	8.43
	Doctoral Units	1	1.21
Years of Teaching Experience	1–5 years	13	15.66
	6–10 years	24	28.92
	More than 10 years	46	55.42
Relevant Trainings and Workshops on Differentiated Instruction	None	3	3.61
	1–2 trainings	23	27.71
	3–5 trainings	35	42.17
	More than 5 trainings	22	26.51

Competencies of Mathematics Teachers in Differentiated Instruction. Table 2 presents the composite summary of teachers' competencies in differentiated instruction, with an overall weighted mean of 3.78 (M = 3.78, SD = 0.42), indicating high competence across all domains. Among the competencies, student engagement ranked highest (M = 3.86, SD = 0.34), suggesting that teachers effectively foster motivation, participation, and interactive learning, whereas readiness and preparation (M = 3.80, SD = 0.39) reflect careful planning and instructional preparedness. Mastery of strategies (M = 3.73, SD = 0.48) was slightly lower, indicating room to refine pedagogical techniques, and assessment and adaptation ranked lowest (M = 3.72, SD = 0.46), highlighting the need to strengthen formative evaluation and responsive adjustments to diverse learners. These trends suggest that while teachers are capable and proactive, targeted professional development, particularly in adaptive assessment strategies, could further enhance instructional effectiveness.

Table 2

Composite Summary of Mathematics Teachers' Competencies in Differentiated Instruction in Bagamanoc North and South Districts (n = 83)

Competency Variable	Weighted Mean	Standard Deviation	Verbal Interpretation	Rank
Readiness and Preparation	3.80	0.39	Highly Competent	2
Mastery of Strategies	3.73	0.48	Highly Competent	3
Student Engagement	3.86	0.34	Highly Competent	1
Assessment and Adaptation	3.72	0.46	Highly Competent	4
Overall Weighted Mean	3.78	0.42	Highly Competent	—

**Legend: 3.25–4.00 = Highly Competent; 2.50–3.24 = Competent; 1.75–2.49 = Less Competent; 1.00–1.74 = Least Competent.*

Instructional Practices Employed by Mathematics Teachers in Differentiated Instruction. In terms of actual classroom implementation, Table 3 illustrates the composite summary of instructional practices, revealing that teachers are highly effective overall (M = 3.61, SD = 0.50).

Table 3

Composite Summary of Mathematics Teachers' Instructional Practices in Differentiated Instruction in Bagamanoc North and South Districts (n = 83)

Instructional Practice Variable	Weighted Mean	Standard Deviation	Verbal Interpretation	Rank
Varied Teaching Strategies	3.59	0.49	Highly Effective	3
Instructional Adaptation	3.74	0.43	Highly Effective	1
Technology Integration	3.43	0.60	Highly Effective	4
Assessment and Feedback	3.68	0.47	Highly Effective	2
Overall Weighted Mean	3.61	0.50	Highly Effective	—

**Legend: 3.25–4.00 = Highly Effective; 2.50–3.24 = Effective; 1.75–2.49 = Less Effective; 1.00–1.74 = Least Effective.*

Instructional adaptation ranked highest (M = 3.74, SD = 0.43), demonstrating teachers' ability to modify lesson delivery, learning activities, and assessment methods to meet students' varying needs and learning profiles. Assessment and feedback followed closely (M = 3.68, SD = 0.47), highlighting active monitoring of student progress and constructive guidance.

Varied teaching strategies (M = 3.59, SD = 0.49) show effective use of multiple instructional approaches, though slightly lower, suggesting potential for further diversification. Technology integration ranked lowest (M = 3.43, SD = 0.60), indicating that while digital tools are employed, more systematic and innovative integration could strengthen learning outcomes. Overall, these results reveal student-centered instructional practices, with targeted support required to enhance digital pedagogy.

Differences in Competencies Based on Profile Variables. Transitioning to group differences, Table 4 shows that teachers' competencies in differentiated instruction vary significantly by age, educational attainment, teaching experience, and participation in relevant trainings and workshops. Specifically, mid-career teachers (36–45 years) and those with higher qualifications exhibited stronger readiness and adaptive competencies, suggesting that accumulated experience and formal education enhance instructional preparedness.

Table 4

Differences in Mathematics Teachers' Competencies in Differentiated Instruction by Profile Variables in Bagamanoc North and South Districts (n = 83)

Profile Variable	Readiness & Preparation	Mastery of Strategies	Student Engagement	Assessment & Adaptation
Age	$F = 13.19$, $p < .001$ ✓	F = 0.71, p = .558 ✗	F = 4.11, p = .024 ✓	F = 11.81, p < .001 ✓
Sex	t = 0.00, p = 1.000 ✗	t = 0.00, p = 1.000 ✗	t = 0.00, p = 1.000 ✗	t = 0.00, p = 1.000 ✗
Educational attainment	F = 36.00, p = .002 ✓	F = 0.20, p = .872 ✗	F = 0.50, p = .215 ✗	F = 19.00, p = .026 ✓
Years of teaching experience	F = 11.20, p = .002 ✓	F = 0.78, p = .482 ✗	F = 21.00, p < .001 ✓	F = 12.33, p = .001 ✓
Relevant DI trainings/workshops	F = 55.35, p = .006 ✓	F = 16.34, p = .013 ✓	F = 17.42, p = .017 ✓	F = 14.31, p < .001 ✓

**Note: ✓ = significant at α = .05; ✗ = not significant. Significant ANOVA results were subjected to post hoc multiple comparisons (reported in Supplementary Tables).*

Similarly, moderate exposure to workshops correlated with higher mastery and engagement, emphasizing the effectiveness of targeted professional development. Sex did not significantly influence any competency, highlighting that effectiveness is shaped more by experience, education, and structured training than by gender. Post hoc analyses confirmed specific group differences, underscoring the importance of strategically tailored capacity-building initiatives to optimize instructional competencies.

Differences in Instructional Practices Based on Profile Variables. Similarly, Table 5 reveals that instructional practices are differentially influenced by profile variables. Age significantly affected instructional adaptation and assessment and feedback, with mid-career teachers demonstrating greater flexibility and effectiveness. Educational attainment influenced varied teaching strategies, adaptation, and assessment, suggesting that higher qualifications equip teachers with broader pedagogical and evaluative skills. Years of teaching experience primarily impacted technology integration, with more experienced teachers demonstrating greater proficiency in using digital tools. Participation in relevant workshops significantly enhanced adaptation and assessment, highlighting the importance of translating professional development into practical classroom improvements. Sex was not a significant factor. Post hoc analyses confirmed these trends, reinforcing that formal qualifications and structured, targeted professional development are central drivers of effective differentiated instruction.

Table 5

Differences in Mathematics Teachers' Instructional Practices in Differentiated Instruction by Profile Variables in Bagamanoc North and South Districts (n = 83)

Profile Variable	Varied Teaching Strategies	Instructional Adaptation	Technology Integration	Assessment & Feedback
Age	F = 1.57, p = .235 ✗	F = 13.76, p < .001 ✓	F = 0.29, p = .830 ✗	F = 12.83, p < .001 ✓
Sex	t = 0.00, p = 1.000 ✗	t = 0.00, p = 1.000 ✗	t = 0.00, p = 1.000 ✗	t = 0.00, p = 1.000 ✗
Educational Attainment	F = 61.08, p < .001 ✓	F = 7.30, p = .003 ✓	F = 2.28, p = .118 ✗	F = 94.33, p = .002 ✓
Years of Teaching Experience	F = 1.68, p = .226 ✗	F = 2.41, p = .392 ✗	F = 8.19, p = .006 ✓	F = 4.75, p = .302 ✗
Relevant DI Trainings/Workshops	F = 1.23, p = .333 ✗	F = 9.99, p < .001 ✓	F = 2.28, p = .118 ✗	F = 23.22, p < .001 ✓

**Note: ✓ = significant at α = .05; ✗ = not significant. Significant ANOVA results were subjected to post hoc multiple comparisons (reported in Supplementary Tables).*

Thus, the findings collectively suggest that mathematics teachers in Bagamanoc North and South Districts are experienced, highly competent, and implement student-centered instructional practices effectively. However, targeted interventions, particularly in adaptive assessment and technology integration,

alongside strategically designed professional development, are critical to further enhance teaching effectiveness and sustain high-quality differentiated instruction across diverse classrooms.

Proposed Action Plan for Enhancing Competencies and Instructional Practices

Rationale. This action plan is designed to strengthen the competencies and instructional practices of Mathematics teachers in Bagamanoc North and South Districts, as identified through the study. Findings revealed that teachers demonstrate high competence, particularly in student engagement, readiness and preparation, and mastery of instructional strategies, indicating strong pedagogical capacity. However, areas requiring further development include assessment and adaptation, technology integration, and the use of varied teaching strategies, reflecting gaps between knowledge and consistent classroom application. To address these gaps, the plan (Table 6) highlights professional development, mentorship, collaboration, and monitoring. With structured opportunities for capacity-building and reflective practice, and coordinated support from school leaders, teachers can better implement differentiated instruction, enhancing Mathematics learning outcomes.

Objectives. Below are the objectives of the proposed action plan:

1. Sustain and further enhance student engagement through effective differentiated instruction strategies.
2. Strengthen teachers' readiness and preparation for consistent and high-quality lesson delivery.
3. Refine mastery of differentiated instructional strategies to address diverse learner needs.
4. Improve assessment and adaptation skills to align instruction with learner abilities.
5. Enhance the implementation of instructional practices, emphasizing adaptation, assessment and feedback, varied strategies, and technology integration.

DISCUSSION

The present study examined the demographic profiles, competencies, and instructional practices of mathematics teachers in Bagamanoc North and South Districts, in Bagamanoc, Catanduanes as well as the influence of profile variables on differentiated instruction (DI).

Table 6

Action plan matrix to enhance competencies and instructional practices in Bagamanoc North and South Districts.

Key Focus Area	Objective	Proposed Action	Persons Responsible	Time Frame	Success Indicators
Student Engagement	Sustain and enhance engagement	Seminars on active learning and learner-centered DI strategies; classroom observations with feedback; recognition of innovative practices	School Heads, District Supervisors, Teachers	Q1–Q4	Increased student participation; positive learner feedback
Readiness and Preparation	Strengthen lesson preparedness	Lesson planning workshops; provision of adaptive templates; monitoring and coaching	School Heads, Mentor Teachers	Q1–Q3	Lesson plans reflect differentiation; improved teacher preparedness
Mastery of Strategies	Refine mastery of DI strategies	Professional development workshops; lesson study and peer-sharing; demonstration teaching	School Heads, Master Teachers, Teacher Leaders	Q1–Q4	Teachers apply varied strategies; improved classroom instruction
Assessment and Adaptation	Enhance assessment and instructional adjustment	Training on differentiated assessment tools; development of learner-responsive rubrics; reflective review sessions	District Supervisors, Math Coordinators, Teachers	Q2–Q4	Improved formative assessment; instruction aligned to learner needs
Instructional Adaptation	Strengthen adaptive teaching	Training on lesson modification; mentoring between experienced and novice teachers; reflective teaching conferences	District Supervisors, Teacher Leaders	Q1–Q3	Adaptive lesson implementation; increased student participation
Assessment and Feedback	Improve feedback practices	Workshops on timely, differentiated feedback; peer review of assessment tools; classroom feedback monitoring	District Supervisors, Teachers	Q2–Q4	Feedback supports learning progress
Varied Teaching Strategies	Expand use of multiple approaches	Training on collaborative and inquiry-based strategies; sharing best DI practices; classroom application monitoring	School Heads, Master Teachers	Q1–Q4	Observed use of diverse strategies
Technology Integration	Strengthen technology use	Workshops on Mathematics education technologies; access to digital learning resources; peer technology support groups	School Heads, District Supervisors, Teacher Champions	Q1–Q3	Technology-integrated lessons; improved engagement

Table 1 indicates a predominance of mid-career teachers aged 36 to 45 years (38.56%), suggesting a stable and experienced workforce capable of sustaining instructional quality. Female teachers represented 78.31% of the sample, reflecting global trends in secondary education (UNESCO, 2019). Most teachers held master's units (77.11%), indicating ongoing professional development, although relatively few had completed full master's or doctoral programs, highlighting opportunities for advanced qualification support (Chan & Yung, 2018; Depaepe et al., 2016). Additionally, 55.42% of teachers had more than ten years of teaching experience, and 42.17% had attended three to five DI-focused workshops, reflecting institutional support for continuous learning, a factor known to enhance instructional readiness, strategic competence, and classroom adaptability (Guskey, 2002; Pozas et al., 2020). Collectively, these findings suggest that teachers are academically prepared, experienced, and engaged in ongoing professional growth, providing a solid foundation for effective differentiated mathematics instruction.

Teachers' competencies in DI, summarized in Table 2, revealed an overall high competence (M = 3.78, SD = 0.42). Student engagement scored highest (M = 3.86, SD = 0.34), reflecting the ability to foster participation and motivation in heterogeneous classrooms (Tomlinson, 2017; Smale-Jacobse et al., 2019). Readiness and preparation (M = 3.80, SD = 0.39) indicated strong lesson planning, whereas mastery of strategies (M = 3.73, SD = 0.48) and assessment and adaptation (M = 3.72, SD = 0.46) were comparatively lower, highlighting areas for targeted improvement. Similarly, instructional practices (Table 3) were highly effective (M = 3.61, SD = 0.50), with instructional adaptation leading (M = 3.74, SD = 0.43), followed by assessment and feedback (M = 3.68, SD = 0.47), varied strategies (M = 3.59, SD = 0.49), and technology integration (M = 3.43, SD = 0.60). These results demonstrate that while teachers employ student-centered practices, targeted support is needed to strengthen adaptive assessment, diversify teaching strategies, and integrate digital tools systematically (Deunk et al., 2018; Ertmer & Ottenbreit-Leftwich, 2010; Smit & Humpert, 2019).

Profile-based analyses (Tables 4 and 5) confirmed that competencies and instructional practices vary significantly with age, educational attainment, teaching experience, and workshop participation. Mid-career teachers and those with higher qualifications demonstrated superior readiness, adaptive capacity, and classroom effectiveness, whereas moderate exposure to professional development was associated with greater strategy mastery and engagement (Chan & Yung, 2018; Pozas et al., 2020; Van Geel et al., 2019). Sex did not significantly influence either competencies or practices, emphasizing that teacher effectiveness is determined more by experience, qualifications, and structured professional development than by demographic factors.

In response to these findings, a comprehensive action plan is recommended to further enhance teacher competencies and instructional practices. Specifically, sustaining and expanding student engagement can be achieved through seminars on active learning, learner-centered strategies, classroom observations, and recognition of innovative practices. Teachers' readiness and preparation can be strengthened through lesson planning workshops, provision of adaptive templates, and coaching sessions, while mastery of instructional strategies can be refined via professional development workshops, peer-sharing, and demonstration teaching. Adaptive assessment skills and instructional adjustments can be targeted through training on differentiated assessment tools, development of learner-responsive rubrics, and reflective review sessions. Furthermore, instructional adaptation, assessment and feedback, and varied strategies can be enhanced through mentoring between experienced and novice teachers, reflective teaching conferences, peer review, and sharing of best practices. Finally, technology integration can be strengthened through workshops on

mathematics education technologies, access to digital learning resources, and peer technology support groups. These targeted interventions provide structured, evidence-based pathways to bridge gaps between teacher knowledge and consistent classroom application, fostering high-quality differentiated instruction and improved student learning outcomes.

In conclusion, mathematics teachers in Bagamanoc North and South Districts are experienced, competent, and implement student-centered practices effectively. Nevertheless, gaps remain in adaptive assessment, technology use, and instructional diversification. By integrating the recommended action plan encompassing professional development, mentorship, collaborative learning, and instructional monitoring teachers' capacity can be enhanced, sustaining high-quality DI and aligning practice with evidence-based competencies (Guskey, 2002; Tomlinson, 2017; Smit & Humpert, 2019). Such structured, targeted, and ongoing interventions ensure that all students benefit from responsive mathematics instruction, while supporting teachers' professional growth in line with contemporary educational standards.

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