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Analysis of Teachers' Attributes in Addressing Basic School Learners' Numeracy Gaps

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Abstract: Background: Numeracy is the ability to use and interpret mathematical information in everyday contexts, essential for learners' academic progress and future opportunities. However, despite ongoing efforts to improve mathematics learning, there is limited empirical evidence on how teachers' diagnostic, adaptive, and motivational attributes affect learners' numeracy outcomes in Nigerian basic schools. **Objectives:** This study investigated how teachers' attributes influence the reduction of numeracy gaps among basic school learners. **Methodology:** The researcher employed a cross-sectional descriptive approach. The study population comprised basic school teachers in the Ilorin metropolis. Using a multi-stage sampling procedure, the researcher selected 1,408 respondents. They collected data with a researcher-designed questionnaire and a pro forma. The instrument's reliability was assessed using the split-half method, and Cronbach's Alpha analysis produced a reliability index of 0.77. The researcher answered two research questions using percentages and grand means and tested one hypothesis using multiple regression at the 0.05 level of significance. **Findings:** The study revealed that basic school learners demonstrated proficiency in numeracy. It also found that teachers' attributes significantly predicted learners' numeracy performance. **Recommendation:** The study recommended that the government increase funding for professional development programmes to enhance teachers' attributes.

Keywords: Teachers' Attributes, Diagnostic Skills, Adaptability Level, Motivation, Numeracy Gaps

تحليل سمات المعلمين في معالجة فجوات المهارات الحسابية لدى تلاميذ المدارس الأساسية

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خلاصة

الخلفية: الحصر هو القدرة على استخدام وتفسير المعلومات الرياضية في السياقات اليومية، ضرورية للتقدم الأكاديمي للمتعلمين والفرص المستقبلية. ومع ذلك، على الرغم من الجهود الجارية لتحسين تعلم الرياضيات، هناك أدلة تجريبية محدودة على كيفية .تأثير المعلمين التشخيص، والقدرة على التكيف، والسمات التحفيزية على نتائج عدد المتعلمين في المدارس الأساسية النيجيرية :الأهداف: بحثت هذه الدراسة كيف تؤثر خصائص المعلمين على تقليل الفجوات في عدد متعلمي المدارس الأساسية. المنهجية استخدم الباحث نهجا وصفيا شاملا. تضمنت الدراسة معلمين في المدارس الأساسية في مدينة إيلورين. باستخدام إجراء أخذ .العينات متعدد المراحل، اختار الباحث 1,408 المستجيبين. قاموا بجمع البيانات مع استبيان مصمم من الباحثين وشكل محترف مؤشر موثوقية قدره 0.77. أجاب الباحث Cronbach تم تقييم موثوقية الأداة باستخدام طريقة النصف المنقسم ، وأنتج تحليل ألفا على سؤالين بحثيين باستخدام النسب المئوية والوسائل الكبرى واختبر فرضية واحدة باستخدام انحدار متعدد عند مستوى 0.05 من الأهمية. النتائج: كشفت الدراسة أن متعلمي المدارس الأساسية أظهروا مستوى متميز من الأداء في الحساب. كما وجدت أن خصائص المعلمين توقعت إلى حد كبير أداء عدد المتعلمين. التوصية: أوصت الدراسة بأن تزيد الحكومة التمويل لبرامج التطوير .المهني لتعزيز سمات المعلمين

الكلمات المفتاحية: سمات المعلمين، ومهارات التشخيص، ومستوى القدرة على التكيف، والدافعية، والفجوات الحسابية

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Introduction

Mathematics plays a decisive role in students' academic progression in Nigeria, yet many dread the subject due to its complexity. Variations in numeracy proficiency create achievement gaps that hinder academic success, with struggles in basic numeracy persisting despite professional interventions, thereby affecting learners' future opportunities (Guhl, 2019). Policymakers seek evidence-based strategies, emphasising the importance of understanding teacher attributes to bridge these gaps. The Nigerian National Policy on Education (NPE) underscores numeracy as essential for all students (Birabil & Ogeh, 2020), advocating for a strong foundation from school entry. Numeracy is critical for functional literacy, lifelong learning, classroom success, workforce participation, and informed citizenship (Federal Republic of Nigeria, 2014; Okorosaye-Orubite, 2019). It is the ability, confidence, and readiness to work with numerical or geographical data; numeracy equips individuals to meet mathematical demands in private and public life, fostering societal engagement (Geiger et al., 2015). It enables the daily use of mathematics, helping citizens make thoughtful and informed decisions (Forgasz et al., 2017).

In 1999, the Federal Government introduced the Universal Basic Education (UBE) Programme to enhance access to and the quality of basic education nationwide, replacing the Universal Primary Education (UPE) Programme. The UBE mandates nine years of compulsory schooling, six years of primary and three years of junior secondary education, ensuring free education across all tiers of government. In 2014, the Federal Republic of Nigeria organised basic education into lower basic (Basic 1–3), middle basic (Basic 4–6), and upper basic (Basic 7–9). Numeracy also supports learners' logical thinking. Teachers' attributes, diagnostic skills, adaptability, and motivation are pivotal in increasing student confidence and closing numeracy gaps (Azucena et al., 2022). Assessing actual numeracy ability can be complex when general mathematics performance does not fully reflect student achievement (Foster, 2016). Diagnostic skills help teachers quickly assess thinking and adapt lessons dynamically (Reuker & Künzel, 2021). Adaptability refers to constructive responsiveness in the learning environment (Collie & Martin, 2016), while motivation reflects the internal drive to teach and achieve educational goals (Han & Yin, 2016).

Theoretical Framework

Based on Bandura's (1986) Social Cognitive Theory (SCT) and Shulman's (1987) Pedagogical Content Knowledge (PCK) Theory, this study explains how teachers' diagnostic, adaptive, and motivational qualities affect students' numeracy outcomes. Shulman's PCK framework emphasizes that effective teaching relies on teachers' ability to integrate subject matter expertise with pedagogical techniques to meet learners' diverse needs. Diagnostic competence corresponds with this approach, necessitating teachers to analyze students' thought processes, recognize misconceptions, and customize instruction to address learning deficiencies (Reuker & Künzel, 2021). Likewise, adaptability exemplifies the fluidity of pedagogical content knowledge (PCK), as educators modify their instructional approaches to accommodate the contextual and cognitive variations among students (Collie & Martin, 2016). Consequently, PCK emphasises that instructors' expertise in diagnostic and adaptive abilities converts their classroom practices into responsive, learner-centred instruction that improves numeracy proficiency.

In addition, Bandura's Social Cognitive Theory (1986) asserts that learning transpires through the interplay of personal, behavioural, and environmental elements, with self-efficacy as a pivotal component. The motivation of teachers, as

defined in this study, aligns with the Social Cognitive Theory's focus on self-efficacy, the conviction in one's ability to affect student learning outcomes (Han & Yin, 2016; Yu & Singh, 2018). Motivated and highly motivated teachers are more likely to continue addressing students' numeracy difficulties, exhibit good attitudes towards mathematics, and foster supportive learning environments (Igoche et al., 2022). PCK and SCT collectively offer a robust theoretical framework: PCK elucidates how educators' knowledge and adaptability influence instructional quality. SCT clarifies the motivations and belief systems that propel persistent efforts to bridge numeracy inequalities among primary school students.

Aims and Objectives of the Study

To address the numeracy disparities among basic school students in Ilorin, Nigeria, the study examined the profiles of teachers, specifically their diagnostic abilities, flexibility, and motivation. Its main goals were to assess students' numeracy proficiency and investigate how teachers' characteristics affect these results. The study aimed to provide practical advice for enhancing numeracy instruction through targeted policy and teacher development initiatives by identifying these connections. The study also addressed two research questions: (1) how teachers can address numeracy gaps, and (2) how students perform on numeracy assessments. Additionally, it investigated the premise that the qualities of teachers do not significantly predict learners' numeracy performance. The study aimed to provide insights that would guide efforts to improve teacher preparation, enhance flexibility, and strengthen motivation, thereby closing the numeracy gap and boosting academic performance in elementary schools.

Research Questions

i. What is the profile of teachers' attributes in addressing numeracy gaps among basic school learners?
ii. What is the performance level of learners in numeracy tests?

Research Hypothesis

H_{o1}: Teachers' attributes (i.e., diagnostic assessment, adaptability, and motivation) do not significantly predict basic school learners' performance in numeracy.

Literature Review

This literature review analyses scholarly perspectives on teachers' attributes, specifically diagnostic skills, adaptability, and motivation, and their impact on learners' performance in numeracy within basic education contexts.

Teacher Diagnostic Skills

Teachers' diagnostic skills involve systematically collecting, analysing, and interpreting information about students' learning environments, processes, and outcomes to guide instructional decisions (Philipp & Leuders, 2014). These skills encompass monitoring academic progress, identifying misconceptions, and tailoring instruction to individual needs, requiring methodological expertise, problem-solving abilities, and strong subject knowledge (Ostermann et al., 2018; Reuker & Künzel, 2021). While professional development initiatives can enhance diagnostic competence (Klug et al., 2016), experience alone does not guarantee improvement (Förtsch et al., 2018; Urhahne & Wijnia, 2018).

However, studies reveal gaps in practice: many teachers, particularly in African contexts, lack training or confidence to implement diagnostic assessments effectively (Akintola et al., 2025; Mjenda et al., 2023), often focusing narrowly on academic progress without addressing underlying learning challenges (Ohle & McElvany, 2015). Evidence also shows intermediate proficiency in diagnostic application (Opesemowo et al., 2024; Yaghmour et al., 2016), with research in Nigerian classroom settings often underrepresented and often characterised

by large class sizes and limited resources. This raises concerns about the contextual efficacy of diagnostic tools and underscores the need for targeted professional development to build teachers' capacity in data-driven, learner-centred instruction.

The literature agrees that diagnostic skills are pivotal for personalised instruction and improved numeracy outcomes. Still, their consistent application requires systemic training, adequate resources, and adaptation to local classroom realities.

Teachers Adaptability Skills

Teachers' adaptability refers to their capacity to adjust instructional strategies to meet diverse student needs and respond effectively to shifting classroom conditions (Collie & Martin, 2016). It involves both micro-adaptations, minor, immediate changes during lessons, and macro-adaptations, which are broader, curriculum-level modifications (Parsons et al., 2018; Van der Lans et al., 2018). Adaptive teaching requires flexibility, strong diagnostic ability, and pedagogical knowledge (Adebayo & Odutayo, 2024). Research demonstrates that adaptability enhances teacher and student self-efficacy (Collie et al., 2020) and improves outcomes for learners with special needs (Lundbäck & Egerhag, 2020).

Despite these benefits, studies often reveal a gap between perceived and actual adaptability. While teachers may be confident in their ability to adapt, self-assessment results frequently indicate only modest skill levels (Abdullah et al., 2023), suggesting they overestimate their capacities (Schipper et al., 2023). In resource-constrained environments, such as many African classrooms where large class sizes are the norm, developing and applying adaptive strategies is particularly challenging. Few empirical studies have focused on African contexts or examined cultural influences on adaptability. Additionally, there is limited evidence connecting adaptive teaching directly to numeracy outcomes in Nigeria's Universal Basic Education (UBE) programme. Overall, the literature positions adaptability as a critical teaching attribute. However, it highlights the need for targeted professional development and contextualised strategies to bridge the gap between teachers' confidence and their demonstrated adaptive competence, especially in numeracy classrooms in resource-limited settings.

Teachers Motivation

Legislation, remuneration, working conditions, career progression, and societal perceptions collectively shape teachers' motivation (Mark, 2015). Positive factors such as merit pay and supportive work environments enhance teachers' commitment and performance (Adeyinka et al., 2018; Kingful & Nusenu, 2015; Sahat et al., 2018), whereas poor conditions, delayed promotions, and limited professional growth opportunities weaken their enthusiasm. Highly motivated teachers often contribute to better learner outcomes in mathematics (Igoche et al., 2022); however, evidence remains inconclusive regarding their impact on students' interest in the subject (Okoye & Tanimowo, 2022).

Key drivers of motivation include work-life balance, autonomy in teaching, avenues for career advancement, and recognition of achievements (Habeeb & Odutayo, 2024; Marinette & Hui, 2021). Addressing these factors through systemic and institutional support can enhance teacher satisfaction and improve student outcomes (Musau et al., 2023). However, challenges persist in resource-constrained African contexts, where sustaining motivation is hindered by large class sizes, inadequate resources, and limited professional support systems. In such environments, even skilled educators may experience reduced engagement, thereby limiting their ability to fully apply diagnostic and adaptive teaching strategies.

In summary, while motivation is critical for sustained instructional

effectiveness, the literature underscores that, in contexts like Nigerian basic education, strengthening environmental and systemic supports is essential to maintaining high teacher morale and maximising their impact on numeracy achievement.

Students' Performance in Numeracy

Studies on students' performance in numeracy reveal mixed outcomes influenced by contextual, instructional, and attitudinal factors. Class size emerges as a significant determinant, with learners in smaller classrooms often outperforming those in larger ones due to enhanced teacher-student interaction (Atodo, 2018). Positive attitudes toward mathematics and perceptions of its usefulness correlate strongly with higher achievement (Hwang & Son, 2021), while a supportive and happy learning environment also fosters above-average performance (Mbarute & Ntivuguruzwa, 2022).

Findings vary considerably across contexts: some research reports that learners demonstrate reasonable proficiency with potential for improvement (Peteros et al., 2022), while others identify poor achievement levels and persistent numeracy gaps (Antipuesto & Tan, 2023). Conversely, studies such as Pitogo and Oco (2023) found high numeracy skills among pupils, indicating that outcomes can be context-specific and linked to instructional quality. Strong correlations exist between mathematics achievement and overall academic success, suggesting that numeracy proficiency contributes to wider educational attainment (Cabuquin & Abocejo, 2023; Odutayo & Fonseca, 2024).

The literature suggests that students' numeracy performance is influenced by classroom dynamics, instructional quality, learner attitudes, and environmental conditions, underscoring the importance of targeted teaching strategies and supportive learning contexts to close performance gaps.

Methods

This study adopted a cross-sectional descriptive approach. The descriptive research design collects observations and data on a specific topic without attempting to establish cause-and-effect relationships. It provides a comprehensive and accurate picture of the population or phenomenon under investigation while identifying and describing the relationships, patterns, and trends revealed in the data (Sirisila, 2023). It collects data from many varied people simultaneously (Thomas, 2023) . Cross-sectional studies were appropriate since they help examine the common characteristics in a particular group and do not require changing the study's variables.

The population for this study consisted of basic teachers in Ilorin metropolis. Basic education in Nigeria comprises three levels: lower, middle, and upper. This study targeted all lower basic teachers in the Ilorin metropolis. The researchers adopted a multi-stage sampling procedure. There are 256 basic schools in the metropolis, spread out over three local government areas (LGAs). The researchers used stratified sampling to group schools by their respective LGAs. A purposive sampling procedure was employed to choose only numeracy teachers across the schools. Afterwards, the researchers employed proportionate sampling techniques to select 128 basic schools (i.e., 50% of the total schools), and they served as the participating schools for data gathering. The researcher opted to use the basic three classes because the students should have spent a minimum of two sessions in basic school, which should provide the teacher with insight into the numeracy challenges of students.

The researcher randomly selected one numeracy teacher from each of the 128 schools in the study, resulting in a total of 128 participating teachers. The researchers also had to ascertain learners' numeracy level in the basic three. Therefore, all three basic learners in the selected 128 basic schools in Ilorin were part of the target

population. The researcher randomly selected ten students from each school for data collection, resulting in a sample of 1,280 learners. A total of 1,408 respondents, comprising teachers and students, participated in the study.

The researcher designed a questionnaire and a pro forma for data collection. The questionnaire was titled "Analysis of Teachers' Attributes in Addressing Basic School Learners' Numeracy Gaps (ATAABSLNG)." The instrument had three sections. Section A consists of demographic information about the participants.

The researcher presented a letter of introduction to all the sampled basic schools in the Ilorin metropolis and obtained the necessary approvals from the school authorities. They, along with 20 research assistants, conducted the data collection. Before administering the ATAABSLNG, the researcher provided relevant information to all respondents and adequately addressed their questions. The researcher strictly adhered to ethical guidelines on confidentiality and anonymity. The Faculty of Education at the University of Johannesburg, South Africa, granted ethical approval for the study. The researcher used mean statistics to answer all the research questions and analysed the first hypothesis using multiple regression at a 0.05 significance level.

Section B presents statements on teachers' attributes, while Section C collects learners' numeracy performance using a pro forma. Mathematics teachers and educational measurement experts validated the instrument, and the researcher incorporated their observations and comments into the final version of the questionnaire. To determine the reliability of ATAABSLNG, the researcher employed the split-half method and analysed the data using Cronbach's Alpha, obtaining a reliability index of 0.77.

In answering the research questions, participants' responses were subjected to an item-by-item analysis using descriptive statistics, including mean and standard deviation.

Question One: What is the performance level of learners in numeracy tests?

The researcher analysed the academic performance of basic school learners in numeracy tests using frequency counts and percentages. They categorised students scoring 0–40 as intermediate performers, 41–69 as proficient, and 70–100 as accomplished. The statistics of respondents' numeracy scores and categories are summarized and presented in Table (1).

Results

Table (1): Academic Performance of Basic Learners in Numeracy Test.

Academic Performance	Frequency (N)	Percentage (%)
Intermediate	503	39.30
Proficient	626	48.91
Accomplished	151	11.79
Total	1280	100.0

As shown in Table (1), the researcher analysed 1,280 numeracy test results and found that 503 learners (39.30%) demonstrated intermediate performance, 626 learners (48.91%) achieved proficient performance, and 151 learners (11.79%) attained accomplished performance.

As revealed in Figure (1) below, the level of basic school learners' performance in numeracy was proficient, as indicated by the majority (48.91%).

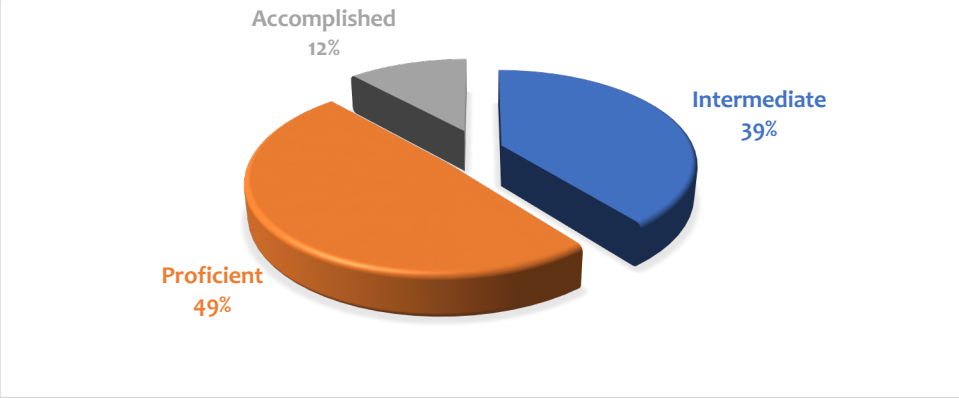

Figure (1): Numeracy Performance.

Question Two: What is the profile of teachers' attributes in addressing numeracy gaps among basic school learners?

Given that there are three questionnaire items on teachers' attributes in addressing numeracy gaps, with each containing five sub-items structured in a four-point Likert scale and the score starting from 1 to 4, a cut-off of 2.50 was therefore used for determining teachers' attributes in addressing numeracy gaps using the grand means. Hence, sub-items with a grand mean score equal to or above 2.50 were marked as 'high' while sub-items with a grand mean below 2.50 were 'low' as displayed in Table (2).

Table (2): Profile of Teachers' Attributes in Addressing Numeracy Gaps Among Basic School Learners

N	Profile of Teachers' Attributes in Addressing Numeracy Gaps		Mean	S.D.
1	**Diagnostic Assessment**	I often use quizzes as a diagnostic assessment tool	3.12	1.26
		I frequently engage in diagnostic assessments to identify numeracy gaps among my students	2.93	1.32
		I use diagnostic assessment data to inform my instructional planning and address numeracy gaps in my teaching practice	3.18	0.97
		I collaborate with colleagues or instructional specialists to analyze assessment data and identify patterns of numeracy difficulties among students	2.79	1.21
		I accurately diagnose numeracy gaps among my students based on diagnostic assessment results	2.61	1.19
		Grand Mean	**2.93**	
		Remark	**High**	
2	**Adaptability**	I organise after-class sessions to provide support for students with numeracy difficulties	3.19	0.79
		I employ multiple strategies to remain flexible and responsive to unexpected challenges or changes in the classroom environment that may impact my students' numeracy learning	2.98	1.08
		I adjust my teaching methods or materials to accommodate students with varying levels of numeracy proficiency in my classroom	2.72	0.87
		I consult my colleagues and experts on appropriate ways to provide support for students with numeracy difficulties	2.62	1.26

		I incorporate feedback from students, colleagues, or professional development opportunities to adapt and refine my approaches to addressing numeracy gaps among my students	2.51	1.19
		Grand Mean	**2.80**	
		Remark	**High**	
3	**Motivation**	I am motivated and committed to continuously addressing numeracy challenges, even in the face of obstacles or constraints	2.17	1.11
		I maintain enthusiasm and passion for teaching numeracy concepts, especially when faced with challenges or setbacks in students' learning	1.81	1.01
		I feel motivated seeing significant progress or improvement in students with numeracy challenges	1.77	1.17
		I am motivated to address numeracy gaps among my students and promote mathematical proficiency in my classroom	1.58	0.88
		I get adequate support and am valued by colleagues, administrators, and the school community in my efforts to address numeracy gaps	1.53	0.96
		Grand Mean	**1.77**	
		Remark	**Low**	

As revealed in Table (2), the diagnostic attributes of teachers' in addressing numeracy gaps often use quizzes as a diagnostic assessment tool, frequently engage in diagnostic assessments to identify numeracy gaps among my students, use diagnostic assessment data to inform their instructional planning, and address numeracy gaps in my teaching practice; collaborate with colleagues or instructional specialists to analyze assessment data and identify patterns of numeracy difficulties among students; and accurately diagnose numeracy gaps among their students based on diagnostic assessment results. Therefore, the diagnostic profile of teachers in addressing numeracy gaps among learners was high, with a grand mean of 2.93.

Also, the teacher adaptability attributes was to organise after-class sessions to provide support for students with numeracy difficulties; employ multiple strategies to remain flexible and responsive to unexpected challenges or changes in the classroom environment that may impact students' numeracy learning; adjust teaching methods or materials to accommodate students with varying levels of numeracy proficiency in the classroom; consult with colleagues and experts on appropriate ways in providing support for students with numeracy difficulties; and incorporate feedback from students, colleagues, or professional development opportunities to adapt and refine my approaches to addressing numeracy gaps among my students. With a mean score of 2.80, the adaptability profile of teachers in addressing numeracy gaps was high.

Lastly, teachers were motivated and committed to continuously addressing numeracy challenges, even in the face of obstacles or constraints; maintained enthusiasm and passion for teaching numeracy concepts, especially when faced with challenges or setbacks in students' learning; felt motivated seeing significant progress or improvement in students with numeracy challenges; motivated to address numeracy gaps among my students and promote mathematical proficiency in my classroom; and get adequate support and valued by colleagues, administrators, and the school community in my efforts to address numeracy gaps. The findings revealed that teachers demonstrated a low motivational profile in addressing

numeracy gaps among basic school learners.

Hypothesis Testing

The researchers tested the hypothesis using linear multiple regression analysis at the 0.05 level of significance. Before conducting a linear regression analysis, the researcher tested the multicollinearity and independence of errors to determine whether the data satisfied the ***assumptions of regression analysis***. Thus, the researcher calculated the tolerance value and variance inflation factor (VIF) to verify the presence of multicollinearity, while also producing a Durbin-Watson statistic to test the independence of errors. As a result, there was no multicollinearity between any independent variables, and the tolerance values ranged from 0.566 to 0.966, while the VIFs were between 1.035 and 1.766. Since the Durbin-Watson statistic was 2.000, there was no autocorrelation in residuals. Additionally, no significant outliers were detected, and the residual errors were normally distributed, ranging from -3.19 to 2.00. Having met the assumptions mentioned above, this study performed a linear regression analysis to verify the relative predictive power of teachers' attributes on the performance of basic school learners in numeracy. The results of the analysis are as follows.

H_{o1}: Teachers' attributes (i.e. diagnostic assessment, adaptability, and motivation) do not significantly predict basic school learners' performance in numeracy.

Table (3a): Regression Model Summary of teachers' attributes (i.e. diagnostic assessment, adaptability and motivation) on basic school learners' performance in numeracy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.202[a]	.041	.039	4.66593

a. Predictors: (Constant), Teachers' Attributes,

As indicated in Table (3a), teachers' attributes (i.e., diagnostic assessment, adaptability, and motivation) jointly contributed to the R-Square of 0.041, representing 4.1% of the dependent variable (basic school learners' performance in numeracy). Thus, the combination of teachers' attributes accounted for the total variance in basic school learners' performance in numeracy. Therefore, teachers' attributes (i.e., diagnostic assessment, adaptability, and motivation) jointly predicted 4.1% of the total variance in the basic school learners' performance in numeracy.

However, significant prediction of independent variables was computed, and the results were shown in Table (3b).

Table (3b): Regression analysis of teachers' attributes as predictors of basic school learners' performance in numeracy

Model		Sum of Squares	df	Mean Square	F	Sig.	Remark
1	Regression	855.191	3	285.063	12.455	.000[b]	Not Accepted
	Residual	29203.440	1276	22.887			
	Total	29058.631	1279				

a. Dependent Variable: Outcomes in Numeracy
b. Predictors: (Constant), Teachers' Attributes

As revealed in Table (3b), the F-value of 12.455 was obtained with a p-value of 0.000 when computed at 0.05 alpha level. Therefore, the null hypothesis is not accepted since the p-value of 0.000 is less than the 0.05 alpha level. Hence, teachers' attributes significantly predicted basic school learners' performance in numeracy ($F_{(3, 1276)} = 12.455$, $p<0.05$).

Beta Weights were equally calculated to determine the contribution of each independent variable. At the same time, unstandardised coefficients reveal how much the dependent variable varies with an independent variable while other independent variables remain constant. Table 3c displays the results.

Table (3c): Relative Contributions of teachers' attributes to the basic school learners' performance in numeracy

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.753	1.466		14.841	.000
	Diagnostic Assessment	.143	.024	.199	5.927	.000
	Adaptability	.117	.021	.124	3.691	.000
	Motivation	.058	.013	.043	1.533	.092

a. Dependent Variable: *Outcomes in Numeracy*

The relative contribution of each independent variable to the dependent variable is shown in Table 3c. Teachers' diagnostic assessment and adaptability were significant (i.e., $p<0.05$) and more associated (predicted) with learners' performance in numeracy, with Beta weights of 0.199 and 0.124, respectively. In contrast, teachers' motivation contributed less and was not a significant ($p>0.05$) predictor of learners' performance in numeracy. The individual contributions of independent variables to the dependent variable are presented in the equation below;

$$Y = a + biX_1 + b_2X_2 + b_nX_n$$

Thus, the weight of each independent variable in this study can be substituted into the equation as

$$Y = 21.753 + 0.199X_1 + 0.124X_2 + 0.058X_2$$

Where;

Y = learners' performance in numeracy

a = Constant (other factors that predicted learners' outcomes in numeracy but not considered in this study) = 21.753

b_1 = Teachers' Diagnostic Assessment = 0.199

b_2 = Teachers' Adaptability = 0.124

b_3 = Teachers' Motivation = 0.058

Discussion

This study found that the level of basic school learners' performance in numeracy was proficient. The average numeracy performance of basic school learners suggests that, while pupils adequately understand basic arithmetic concepts, there remains ample opportunity for further development. This average result suggests that many students meet the baseline competence levels but may require assistance with more complex or higher-order mathematical skills. Factors contributing to this include varied instructional quality, restricted access to educational resources, and various student backgrounds and learning requirements. To address numeracy gaps, educators must implement targeted interventions that strengthen fundamental numeracy skills, enhance teaching methods, and support struggling learners. By focusing on these areas, educators can raise students' numeracy performance from average to above average, ensuring that learners are better prepared for future academic challenges and real-world applications. The results of this study corroborate those of Peteros et al. (2022), who found that students' numeracy performance was passable. On the other hand, Pitogo and Oco (2023) discovered that the pupils possess strong numeracy abilities.

Teachers' diagnostic characteristics in addressing numeracy gaps among learners are promising, indicating that they are skilled at utilising diagnostic evaluations to identify pupils' individual learning requirements and comprehension gaps. Teachers can use these evaluations to gather comprehensive information about their students' numeracy skills and areas for improvement. This data-driven method enables teachers to effectively customise their instructional preparation, ensuring that

sessions address identified gaps while reinforcing students' arithmetic skills. Quizzes are an incredibly efficient diagnostic tool, providing a rapid, practical way to assess pupils' understanding of specific mathematical concepts. Teachers identified areas where pupils struggled by analysing quiz results, including fundamental arithmetic, problem-solving, and comprehension of more advanced mathematical concepts.

Teacher diagnostic features align with Shulman's (1987) PCK Theory, highlighting teachers' ability to integrate subject knowledge with pedagogical insight to identify and address learners' misconceptions. Teachers' diagnostic abilities, using quizzes to identify numeracy weaknesses and adjust teaching support, align with the PCK notion of transferring content knowledge into learner-centered teaching. This diagnostic skill demonstrates teachers' self-efficacy in assessing students' thinking and intervening to improve learning, as well as Bandura's (1986)Social Cognitive Theory. Thus, teachers' diagnostics enhance instructional responsiveness in terms of cognitive and technical skills. The study indicated that PCK and SCT's self-efficacy-based diagnostic competence enhances basic school learners' numeracy skills. Consistent with the findings of this study, Reuker and Künzel (2021) found in their independent studies that teachers' diagnostic skills involve observing teaching events and identifying key areas of focus, interpreting and assigning meaning to those events from an instructional perspective, and deciding how to respond to analysed events to support learning processes effectively. However, Mjenda et al. (2023) claimed that most maths educators are unaware of diagnostic tests, misinterpret their role in teaching and learning, and avoid using them because they lack the necessary skills.

Teachers' high adaptability in addressing numeracy gaps demonstrates their capacity to respond effectively to their pupils' changing demands. Teachers who organise after-class sessions demonstrate their dedication to giving additional help to students who struggle with arithmetic. These sessions provide students with personalised attention and targeted training, helping them to work through their challenges in a friendly setting. Furthermore, instructors' flexibility includes their capacity to respond to unanticipated problems or changes in the classroom environment that may impact students' numeracy learning. Adaptive instructors may adjust their teaching tactics to maintain effective learning environments, whether due to a sudden shift in curriculum, changing student demands, or unanticipated disruptions. Adaptive teachers ensure that all students enjoy a consistent, supportive educational experience, focusing on their numeracy development regardless of their circumstances.

Teacher adaptability aligns with Shulman's (1987) PCK Theory, which emphasizes that teachers need to adjust instructional decisions to meet diverse learner needs and changing classroom contexts. Teachers organised after-class support, adjusted teaching approaches for different numeracy competence levels, and used feedback to improve practice, demonstrating PCK's responsive, context-specific pedagogy. According to Bandura's (1986) Social Cognitive Theory (SCT), such adaptive behaviours exhibit high self-regulation and situational efficacy, indicating that teachers can overcome instructional hurdles and sustain effective numeracy learning. This study identifies adaptation as a pedagogical skill and a behavioural expression of self-efficacy, enabling teachers to sustain learning continuity in the face of unforeseen disruptions. PCK and SCT indicate that effective adaptation is crucial for transforming instructional flexibility into improvements in numeracy. This study supports previous research by Parsons et al., 2018; Van der Lans et al. (2018), and

van Geel et al. (2019), which found that effective teachers are flexible since meeting the unique requirements of each student is a challenging task, especially in classrooms with a growing variety of students.

Poor motivational opportunities for teachers to address numeracy gaps among basic school children imply that they may lack the energy or inspiration to actively and persistently enhance students' numeracy skills. Lack of professional development opportunities, insufficient resources, excessive student-to-teacher ratios, and general work unhappiness contributed to the outcome of this study. Teachers who lack motivation may struggle to incorporate excitement and innovation into their instructional approaches, making it more challenging to devise effective strategies to address numeracy gaps. As a result, pupils may not receive the motivation and support needed to overcome their maths issues, leading to ongoing underperformance. Systemic changes are needed to address this issue and raise teacher morale. These changes include providing teachers with additional support, resources, and training, as well as acknowledging and rewarding their efforts to improve student achievement. Unsatisfactory working conditions, inadequate teacher incentives (Kolawole & Akinsola, 2018), limited fringe benefit payments, and insufficient promotion of in-service training (Musau et al., 2023) significantly influenced students' mathematics performance.

Bandura's (1986) Social Cognitive Theory (SCT) supports the study's finding that teachers' low motivation results from diminished self-efficacy, which develops under inadequate resources, heavy workloads, and unsupportive environments, reducing their persistence in improving numeracy outcomes. Similarly, Shulman's (1987) Pedagogical Content Knowledge (PCK) Theory indicates that low motivation weakens teachers' effective use of diagnostic and adaptive skills, as enthusiasm and persistence are essential for responsive, learner-centred teaching. These insights suggest that although teachers may possess knowledge and adaptability, their effectiveness remains limited without the motivational drive for consistent implementation. The theoretical framework emphasizes the importance of providing systemic support and incentives to enhance teachers' confidence in their ability to improve student achievement.

Additionally, in this study, teachers' attributes were found to predict the numeracy performance of basic school learners significantly. The vital influence that teachers' diagnostic, adaptability, and motivation attributes have in predicting the numeracy performance of basic school students highlights the importance of these elements in educational outcomes. Proficiency in diagnostic abilities enables teachers to precisely pinpoint and attend to each student's unique learning needs, ensuring that instructional strategies are tailored to close the numeracy gap. High flexibility allows teachers to maintain a supportive learning environment that fosters ongoing student growth while effectively responding to unforeseen problems and shifting classroom dynamics. On the other hand, motivation is just as crucial as it propels educators to put effort and ingenuity into their instruction, creating a stimulating and encouraging environment that promotes student success. Combined, these qualities enable teachers to teach mathematics in a thorough, flexible, and engaging manner, thereby enhancing students' numeracy skills. Teachers should adopt a more pragmatic approach to teaching mathematics, and education authorities should provide additional resources to schools with limited facilities (Ortega-Rodríguez, 2023; Yu & Singh, 2018).

The results show that specific teaching qualities are more important than general enthusiasm, revealing that teachers' diagnostic competence and flexibility are more strongly associated with and predictive of learners' numeracy

achievement. At the same time, motivation contributed to a lesser extent.

Using diagnostic assessment skills, teachers may identify each student's unique arithmetic issues and modify their lesson plans, improving student performance. In this way, flexibility enables teachers to readily adjust their approaches and plans in response to shifting classroom dynamics and unique student needs, ensuring that education continues to thrive in various settings. Although a positive and engaging classroom environment primarily depends on teacher motivation, these findings suggest that teachers' ability to accurately diagnose students' learning needs and adjust their teaching strategies has a significant impact on students' performance. Therefore, attention should be focused on increasing motivation and strengthening teachers' diagnostic and adaptive abilities to achieve improved numeracy outcomes (Kron et al., 2022).

Conclusion and Recommendation

The substantial influence of teachers' diagnostic evaluation and flexibility on students' numeracy performance highlights the vital role of these abilities in teaching. Addressing numeracy gaps and promoting student achievement are more easily accomplished by teachers who can effectively identify students' learning needs and adjust their teaching strategies. Even while teacher motivation is essential, research indicates that it has minimal impact on predicting numeracy achievement. Instead, research suggests that boosting instructional qualities, such as diagnostic skills and flexibility, is more critical for improving student results. Therefore, professional development programs should prioritize these areas to provide teachers with the skills and strategies required to successfully assist students' mathematical learning. Based on the findings, the following were recommended:

a. Increased government financing is needed for professional development programs that enhance teachers' diagnostic and adaptive abilities and offer more motivating incentives.
b. Supporting adaptive teaching techniques that enable adaptable instructional tactics catered to the diversity of the classroom should be a priority for educational policymakers.
c. School administrators should create a supportive atmosphere that promotes and fosters adaptable teaching methods. This can be accomplished by providing educators with the time and tools to utilize diagnostic tests and adjust their pedagogy accordingly.
d. Curriculum specialists are responsible for creating and executing curricula that include diagnostic assessment tools and adaptive learning methodologies.

Implications of this Study

This study suggests that instructor enthusiasm alone is not as effective as good teaching strategies in influencing students' numeracy abilities. While enthusiastic teachers are vital, even more critical for boosting student accomplishment in mathematics is the capacity to effectively diagnose students' strengths and weaknesses and modify instruction accordingly (adaptability).

Future Research

Future studies should employ experimental and longitudinal designs to investigate the efficacy of focused professional development treatments and examine how teachers' diagnostic, adaptive, and motivational qualities impact students' numeracy performance over time. Comparative studies across various regions and educational contexts in Nigeria are essential to determine the influence of environmental, socio-economic, and institutional factors on numeracy outcomes. Researchers need to investigate the incorporation of digital tools and learning analytics to improve teachers' diagnostic

and adaptive teaching methods, especially in resource-limited educational settings.

Disclosure Statements

- This work is not taken from any master's or doctoral thesis.
- **Authors' Contribution**: …. Introduction, the study's aims and objectives, and literature review. Conclusions, Recommendations, and the Abstract, respectively.
- **Ethical Issues**: The researcher made sure that all authors whose works were consulted throughout this research were officially recognised and correctly referenced. The researcher also ensured no plagiarism in the literature they consulted.
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Data Analysis Statement

The study's data analysis combined descriptive and inferential statistical techniques to answer the research questions and hypotheses. Mean, standard deviation, frequency counts, and percentages were among the descriptive statistics used to examine the performance level of students on numeracy assessments as well as the characteristics of teachers (motivation, diagnostic abilities, and adaptability). With a cut-off mean score of 2.50, teachers' qualities were classified as "high" or "low". Multiple regression analysis was used to test the hypothesis to determine whether teachers' characteristics significantly predicted students' numeracy achievement. Diagnostic skills and adaptability were significant predictors, but motivation was not, and the regression model explained 4.1% of the variance in numeracy outcomes. Regression assumptions like multicollinearity and error independence were examined and satisfied, guaranteeing the validity of the results. The findings, which were interpreted at a significance level of 0.05, provide evidence-based perspectives on the connection between student performance and the characteristics of teachers.

References

Abdullah, N. K. E. , Hamzah, M. I. , Yasin, M. H. M., & Nasri, N. M. (2023). The level of adaptive teaching skills among primary school teachers in implementing the zero reject policy: A study in rural Sarawak. *Proceedings of the 6th International Conference on Learning Innovation and Quality Education,* Indonesia. https://doi.org/10.2991/978-2-38476-114-2_3

Adebayo, A. A., & Odutayo, A. O. (2024). Menace of school-related gender-based violence in higher institutions. *Journal of Pedagogical Sociology and Psychology*, *6*(3), 10–20. https://www.j-psp.com/volume-6/issue-3

Adeyinka, A. R., Asabi, O., & Adedotun, O. O. (2018). Teachers` motivation on students` performance in mathematics in government secondary schools, Makurdi Lg Area. *International Journal of Humanities and Social Science Invention*, *2*(5), 35–41.

Akintola, M. A., Adebayo, A. A., & Odutayo, A. O. (2025). Innovative Strategies for Integrating Entrepreneurship into Teacher Education: A Systematic Review. *Ilorin Journal of Education*, *45*(2), 306–321. https://ije.unilorinedu.sch.ng/index.php/ije/article/view/257

Antipuesto, J. L., & Tan, D. A. (2023). Students' academic performance and

engagement in mathematics via blended learning. *American Journal of Educational Research*, *11*(4), 235–240. https://doi.org/10.12691/education-11-4-7

Atodo, R. I. (2018). *Impact of large class size on students' performance in mathematics in college of education Minna, Niger State*. Federal University of Technology.

Azucena, L. J. R., Gacayan, P. J. L., Tabat, M. A. S., Cuanan, K. H., & Pentang, J. (2022). GeoGebra intervention: How have students' performance and confidence in algebra advanced? . *Studies in Technology and Education*, *1*(1), 51–60. https://doi.org/10.55687/ste.v1i1.17

Bandura, A. (1986). Social foundations of thought and action. In *A social cognitive theory*. Prentice-Hall.

Birabil, S. T., & Ogeh, O. W. M. (2020). Education in Nigeria: challenges and way forward. *International Journal of Academic Research and Reflection*, *8*(1), 42–48.

Cabuquin, J. C., & Abocejo, F. T. (2023). Mathematics learners' performance and academic achievement at a public high school institution in Leyte, Philippines. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *13*(2), 123–136. http://dx.doi.org/10.30998/formatif.v13i2.17235

Collie, R. J., Granziera, H., Martin, A. J., Burns, E. C., & Holliman, A. J. (2020). *Adaptability among science teachers in schools: A multi-nation examination of its role in school outcomes*. *50*(2), 1–47. https://doi.org/10.1016/j.tate.2020.103148

Collie, R. J., & Martin, A. J. (2016). Adaptability: An important capacity for effective teachers. *Educational Practice and Theory*, *38*(1), 27–39.

Federal Republic of Nigeria. (2014). *National Policy on Education*. NERDC.

Forgasz, H. J., Gilah, L., & Hall. J. (2017). Numeracy across the curriculum in australian schools: teacher education students' and practicing teachers' views and understandings of numeracy. *Numeracy*, *10*(2), 1–22. http://doi.org/10.5038/1936-4660.10.2.2

Förtsch, C., Sommerhoff, D., Fischer, F., Fischer, M. R., Girwidz, R., Obersteiner, A., & Neuhaus, B. J. (2018). Systematizing professional knowledge of medical doctors and teachers: Development of an interdisciplinary framework in the context of diagnostic competences. *Education Sciences*, *8*(4), 207–215. https://doi.org/10.3390/educsci8040207

Foster, C. (2016). Confidence and competence with mathematical procedures. *Educational Studies in Mathematics, 91, 271-288.*https://doi.org/10.1007/s10649-015-9660-9

Geiger, V., Goos, M., & Forgasz, H. (2015). A rich interpretation of numeracy for the 21st century: A survey of the state of the field. *ZDM Mathematics Education*, *47*(1), 531–548. https://doi.org/10.1007/s1185 8-015-0708-1

Guhl, P. (2019). *The impact of early math and numeracy skills on academic achievement in elementary school.*

[Master of Education], Northwestern College.

Habeeb, A. O., & Odutayo, A. O. (2024). A Quantitative Study Examining the Relationship Between Parental Socioeconomic Status, Body Image, Peer Influence, and Self-esteem Among Adolescents. *Research in Social Sciences and Technology*, *9*(2), 51–71.

Han, J., & Yin, H. (2016). Teacher Motivation: Definition, research development and implications for teachers. *Cogent Education*, *3*(1), 1–18.

Hwang, S., & Son, T. (2021). Students' attitude toward mathematics and its relationship with mathematics achievement. *Journal of Education and E-Learning Research*, *8*(3), 272–280.

Igoche, S. F., Ogugua, K. K., & Takor, D. I. (2022). Influence of teachers' motivation on students' performance in mathematics in secondary schools in Okpokwu, Benue State, Nigeria. *Village Math Educational Review (VER)*, *3*(1), 135–155. https://doi.org/10.5281/zenodo.5821184

Kingful, S., & Nusenu, A. A. (2015). Teachers' motivation in senior high schools in Ghana: A case of Ghana senior high school. *Journal of Education and Practice*, *6*(16), 110–122. https://files.eric.ed.gov/fulltext/EJ1079982.pdf

Klug, J., Gerich, M., & Schmitz, B. (2016). Can teachers' diagnostic competence be fostered through training and the use of a diary? *Journal for Educational Research Online*, *8*(3), 184–206. https://doi.org/10.25656/01:12825

Kolawole, W. S., & Akinsola, M. K. (2018). Motivation of teachers as it affects teaching of mathematics in government secondary schools in Federal Capital Territory Abuja. *Research on Humanities and Social Sciences,* *8*(9), 1–5. https://core.ac.uk/download/pdf/234676303.pdf

Kron, S., Sommerhoff, D., & Achtner, M. (2022). Cognitive and motivational person characteristics as predictors of diagnostic performance: Combined effects on pre-service teachers' diagnostic task selection and accuracy. *J Math Didakt*, *43*(1), 135–172. https://doi.org/10.1007/s13138-022-00200-2

Lundbäck, B., & Egerhag, H. (2020). Lesson study as a bridge between two learning contexts. *International Journal for Lesson and Learning Studies*, *9*(3), 289–299.

Marinette, B., & Hui, X. (2021). School environment and teachers' job satisfaction. *European Journal of Education Studies*, *8*(17). https://doi.org/10.46827/ejes.v8i7.3799

Mark, A. (2015). *Factors influencing teachers' motivation and job performance in Kibaha District, Tanzania* [M. Ed. Dissertation], Open University of Tanzania.

Mbarute, E. S., & Ntivuguruzwa, C. (2022). Factors affecting students' performance in Mathematics in Upper Secondary Schools in Gicumbi District, Rwanda. *Journal of Research in Innovation and Implications in Education*, *6*(3), 13–17.

Mjenda, M., Mutarutinya, V., & Owiti, D. (2023). Diagnostic assessment knowledge and practices among secondary school mathematics teachers in Dodoma, Tanzania. *African Journal of Empirical Research*, *4*(2), 1119–1129.

Musau, L. M., Cheloti, S., & Njue, A. (2023). An assessment of teacher motivation in determining academic performance of secondary school learners in Kenya. *International Journal of Management Studies and Social Science Research*, *5*(4), 409–418. https://doi.org/10.56293/IJMSSSR.2022.4692

Odutayo, A. O., & Fonseca, K. (2024). Making quadratic functions interesting: Students teams-achievement division instructional strategy. *EURASIA Journal of Mathematics, Science and Technology Education*, *20*(1), 1–11. https://doi.org/10.29333/ejmste/14092

Ohle, A., & McElvany, N. (2015). Teachers' diagnostic competences and their practical relevance. *Journal for Educational Research Online*, *7*(2), 5–10. https://doi.org/10.25656/01:11487

Okorosaye-Orubite, A. K. (2019). Education in Nigeria. In Y.M Abdulrahman & F. G Paulley (Eds.), *Education and development in Nigeria*. PI African Press.

Okoye, N. S., & Tanimowo, R. I. (2022). Teachers' experience and motivation as predictors of students' achievement and interest in mathematics in Delta North Senatorial District, Nigeria. *International Journal of Research and Scientific Innovation (IJRSI)*, *9*(5), 22–29.

Opesemowo, O. A. G., Adewuyi, H. O., Odutayo, A. O., & Jacob, U. S. (2024). Exploring remote supervision in higher education: Lecturers' experiences. *Innovations in Education and Teaching International*, *62*(3), 781–794.

Ortega-Rodríguez, P. J. (2023). Personal factors of students that predict performance in mathematics in Primary Education in the United States. *Faculty Journal of Curriculum and Teacher Education*, *27*(3), 175–196. https://doi.org/10.30827/profesorado.v27i3.2

Ostermann, A., Leuders, T., & Nückles, M. (2018). Improving the judgment of task difficulties: prospective teachers' diagnostic competence in the area of functions and graphs. *Journal of Mathematics Teacher Education*, *21*(1), 579–605.

Parsons, S. A., Vaugh, M., Scales, R. Q., Gallagher, M. A., Parsons, A. W., Davis, S. G., Pierczynksi, M., & Allen, M. (2018). Teachers' instructional adaptations: A research synthesis. *Review of Educational Research*, *88*(2), 205–242.

Peteros, E., Gamboa, A., Etcuban, J. O., Dinauanao, A., Sitoy, R., & Arcadio, R. (2022). Factors affecting mathematics performance of junior high school students. *International Electronic Journal of Mathematics Education*, *15*(1), 1–13. https://doi.org/10.29333/iejme/5938

Philipp, K., & Leuders, T. (2014). Diagnostic competences of mathematics teachers—Unpacking a complex construct in teacher education and teacher practice. In *International perspectives on teacher*

knowledge, beliefs and opportunities to learn (pp. 467–486). Springer.

Pitogo, S., & Oco, R. (2023). Pupils' numeracy skills and mathematics performance. *International Journal of Multidisciplinary Research and Publications*, *6*(2), 333–340.

Reuker, S., & Künzel, S. (2021). Learning diagnostic skills for adaptive teaching –a theoretical foundation. *Cogent Education*, *8*(1), 1–13. https://doi.org/10.1080/2331186X.2021.1887432

Sahat, H. N., Abd. Rahman, A. Y., Tengah, K. A., Li, H., & Abdullah, N. A. (2018). A Study of mathematics teachers' motivation towards teaching in Brunei Darussalam. *Journal of Studies in Education*, *8*(2), 18–28. https://doi.org/10.5296/jse.v8i2.12732

Schipper, T. M., Goei, S. L., & de Vries, S. (2023). *Dealing with the complexity of adaptive teaching through collaborative teacher professional development. Effective Teaching Around the World* (R. Maulana, Ed.). LEARN! Research Institute. https://doi.org/10.1007/978-3-031-31678-4_32

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57*(1), 1–23. https://doi.org/10.17763/haer.57.1.j463w79r56455411

Sirisila, S. (2023). *Bridging the gap: Overcome these 7 flaws in descriptive research design*. https://www.enago.com/academy/descriptive-research-design/

Thomas, L. (2023). *Cross-Sectional study: Definition, uses & examples*. https://www.scribbr.com/methodology/cross-sectional-study/

Urhahne, D., & Wijnia, L. (2018). A review on the accuracy of teacher judgments. *Educational Research Review*, *32*(1), 1–26. https://doi.org/10.1016/j.edurev.2020.100374

Van der Lans, R. M., Van de Grift, W. J. C. M., & Van Veen, K. (2018). Developing an instrument for teacher feedback: Using the Rasch model to explore teachers' development of effective teaching strategies and behaviors. *The Journal of Experimental Education*, *86*(2), 247–264.

van Geel, M., Keuning, T. , Frèrejean, J., Dolmans, D. , van Merriënboer, J., & Visscher, A. J. (2019). Capturing the complexity of differentiated instruction. *School Effectiveness and School Improvement*, *30*(1), 51–67.

Yaghmour, K. S., Obaidat, L. T., & Hamadneh, Q. M. (2016). The level of diagnostic tests' preparation skills among the teachers of the first three elementary grades' teachers at the directorate of education of Bani Kinana District. *Journal of Education and Practice*, *7*(9), 155–164. https://files.eric.ed.gov/fulltext/EJ1095747.pdf

Yu, R. R., & Singh, K. (2018). Teacher support, instructional practices, student motivation, and mathematics achievement in high school. *Journal of Educational Research*, *111*(1), 81–94. https://doi.org/10.1080/00220671.2016.1204260