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Behind the numbers: Teachers' personal numeracy habits and strategies

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Abstract

Aim: This study aimed to examine school administrators' perceptions of teachers' personal numeracy habits and instructional strategies, including their relationships and variations across demographic variables, with implications for improving teaching practices and educational evaluation systems.

Methodology: A non-experimental quantitative descriptive-correlational design was employed involving 30 school administrators. Data were analyzed using descriptive statistics, Kendall's tau correlation, and Kruskal–Wallis tests to determine relationships and differences among variables.

Results: Findings revealed that teachers' personal numeracy habits (M = 3.30) and instructional strategies (M = 3.28) were highly evident. A significant positive relationship was found between numeracy habits and strategies. Additionally, administrators' assessments varied significantly across demographic characteristics.

Conclusion: The study highlights the importance of strengthening teachers' personal numeracy engagement to enhance instructional effectiveness. It also underscores the need for more consistent and coherent evaluation systems among school administrators to support improved teaching practices and learning outcomes in mathematics education.

Keywords: *Teacher numeracy; numeracy habits; numeracy strategies; school administrators; mathematics education*

INTRODUCTION

Numeracy enables quantitative reasoning and real-world problem-solving. It is recognized as central to 21st-century education (Geiger & Schmid, 2024). However, national assessments show persistent math achievement gaps in the US. These gaps are confirmed in Texas at both elementary and secondary levels. As a result, the Texas Education Agency (TEA) has intensified efforts to improve numeracy instruction and teacher development, notably in districts like Ector County and at Permian High School in Odessa (National Center for Education Statistics (NCES), 2024; TEA, 2023).

Much research has examined students' numeracy skills. However, there is little focus on teachers' personal numeracy habits and instructional strategies. Administrator perspectives are also underexplored, even though principals play a key evaluative role under statutory frameworks. The influence of demographic variables such as age, gender, educational qualifications, and length of service on teacher practices and administrator assessments remains insufficiently investigated (Berhanu, 2025; Hove et al., 2023; Wang et al., 2022; Weinhandl et al., 2025).

This study addresses these gaps by examining teachers' personal numeracy habits and instructional strategies as assessed by administrators at Permian High School. It integrates four analytical dimensions—personal numeracy habits, instructional strategies, administrator-based evaluation, and demographic profiling—within a single descriptive-comparative framework. The intent is to benefit teachers, administrators, curriculum developers, and policymakers with evidence aligned to TEA-driven educational reform priorities.

Review of Related Literature and Studies

Numeracy as a Professional Competency in Teaching

Numeracy extends beyond computation to encompass the critical interpretation, application, and communication of quantitative information across real-world contexts, a competency increasingly recognized as

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essential to professional teaching practice (Geiger & Schmid, 2024; Goos & O'Sullivan, 2023). Scholars consistently argue that measuring teachers' personal numeracy competence, rather than merely their pedagogical delivery, should be incorporated into professional standards and evaluation frameworks to more accurately reflect instructional quality (Getenet, 2022; Wang et al., 2022).

Teachers' Personal Numeracy Habits

Teachers' Personal Numeracy Habits (PNH) involve regularly working with numeracy in day-to-day situations independently, such as interpreting and using data, handling finances, and making evidence-based decisions. Practices like these bolster teachers' numerate identities, which shape how confidently and authentically they model mathematical thinking in the classroom (Hoogland, 2023). While these dispositions are identified as essential for effective instruction, there is limited research on how teachers engage in numeracy practices outside of school and how these practices are translated into teaching, especially at the secondary level (Wang et al., 2022).

Numeracy Strategies and Problem-Solving Approaches

Numeracy strategies are the thought processes teachers use to solve quantitative problems, draw conclusions, and apply mathematical thinking across contexts. There is evidence that evidence-based solutions tailored to a specific area, such as mathematics, are superior to generic strategies. Nonetheless, research has focused more on the delivery than on how teachers think through and apply the strategies internally. The relationship between teachers' own strategic thinking and their effectiveness is still unclear (Weinhandl et al., 2025).

School Administrators' Role in Assessing Teacher Competence

School administrators provide externally validated assessments of teacher performance that transcend self-reporting measures and directly inform professional development decisions, with research confirming that principals who actively observe and provide structured instructional feedback contribute meaningfully to improved teaching quality and student outcomes (Poulou et al., 2023; Hunter, 2024). Yet despite these established evaluative responsibilities, no current accountability protocol specifically addresses the assessment of teachers' personal numeracy habits or mathematical strategies, revealing a critical gap between evaluation policy and instructional practice (Karakose et al., 2024).

Demographic Variables and Variations in Assessment

Demographic characteristics—including age, gender, educational qualifications, and length of service—consistently influence both how teachers perform and how administrators perceive that performance. Studies confirm significant variation in evaluative outcomes across these variables (Bacus et al., 2024; Hove et al., 2023; Berhanu, 2025). Nevertheless, the interaction between these demographic factors and administrators' assessments of teachers' numeracy habits and strategies has yet to be specifically examined, leaving this intersection critically underexplored.

Synthesis and Research Gap

Literature affirms numeracy as a multidimensional professional competency, underscores the significance of teachers' personal habits and strategies for instructional effectiveness, and recognizes administrators' central evaluative role in accountability-driven reform contexts. Three intersecting gaps persist, however: the absence of empirical studies on teachers' personal numeracy habits as distinct from classroom pedagogy; the lack of administrator-centered perspectives on numeracy-specific teacher assessment; and the unexamined influence of demographic variables on how such assessments are formed. This study addresses all three gaps by examining school administrators' assessments of teachers' personal numeracy habits and instructional strategies, with attention to demographic variation, and by offering a contextually grounded, policy-relevant framework aligned with current TEA-driven educational reform priorities.

Theoretical Framework

The study draws on Numeracy Theory, Constructivist Learning Theory, and Andragogy. Teachers' engagement in numeracy informs strategic practice. Numeracy Theory suggests that using mathematical reasoning in daily life empowers teacher decision-making (Sakurai & Goos, 2023). Constructivist Learning Theory holds that knowledge develops through experience (Sreelohor, 2025). Using personal numeracy habits as problem-solving strategies highlights the theory's embeddedness. Self-directed learning and reflection further strengthen these strategies in line with Andragogy (Loeng, 2024). Overall, these views show that personal numeracy habits shape numeracy strategies.

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Conceptual Framework

Based on school administrators' assessments, it is inferred that teachers' personal numeracy habits (PNH) are the independent variable influencing numeracy strategies as the dependent variable. Personal numeracy habits involve regularly using numerical reasoning in everyday life; numeracy strategies involve the cognitive and procedural skills that help solve problems and make decisions. The strength of this relationship is influenced by age, sex, educational level, and years of teaching experience as moderating factors. The model presupposes that being numerate on an ongoing basis enhances strategic competence, thereby explaining how habits of the self-become instructional behavior for the other.

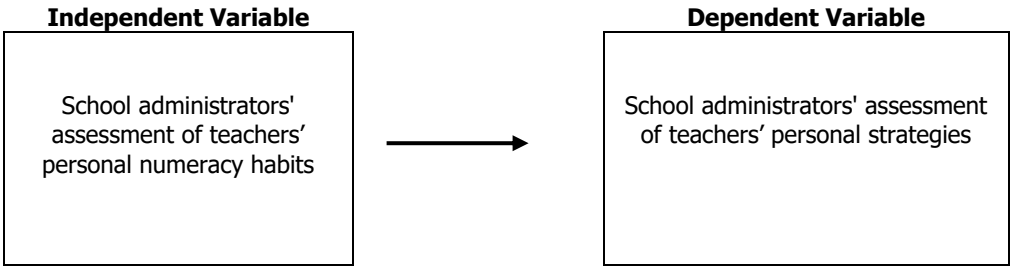

Figure 1. Research Paradigm

Statement of the Problem

Numeracy is a critical component of effective teaching and learning, particularly in mathematics education, as it supports problem-solving, reasoning, and real-life application of knowledge. While existing research has extensively examined instructional practices and student performance, there remains limited attention to teachers' personal numeracy habits and how these influence their instructional strategies. Furthermore, the role of school administrators in assessing these competencies, as well as the variations in such assessments based on demographic characteristics, is underexplored.

This gap presents a significant challenge in educational leadership and teacher development, as understanding the relationship between teachers' personal numeracy practices and their instructional strategies is essential for improving teaching quality and student learning outcomes. Therefore, this study seeks to examine teachers' personal numeracy habits and strategies from the perspective of school administrators and to determine how these assessments vary across selected demographic variables.

Research Objectives

General Objective

To examine teachers' personal numeracy habits and instructional strategies from the perspective of school administrators, including their relationship and variations across demographic variables.

Specific Objectives

Specifically, this study aims to:

1. To describe the profile of school administrators in terms of:
   a. Age;
   b. Sex;
   c. Highest educational attainment; and
   d. Length of service.
2. To assess teachers' personal numeracy habits and instructional strategies as perceived by school administrators.
3. To determine the significant relationship between teachers' personal numeracy habits and instructional strategies.
4. To determine the significant differences in administrators' assessments of teachers' numeracy habits and strategies when grouped according to their profile variables.

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Research Questions

1. What is the profile of the school administrators in terms of:
   a. Age;
   b. Sex;
   c. Highest educational attainment; and
   d. Length of service?
2. How do school administrators assess teachers' personal numeracy habits and instructional strategies?
3. Is there a significant relationship between teachers' personal numeracy habits and instructional strategies?
4. Is there a significant difference in administrators' assessments of teachers' personal numeracy habits and strategies when grouped according to their profile variables?

Hypotheses

H_{01}: There is no significant relationship between teachers' personal numeracy habits and instructional strategies.
H_{11}: There is a significant relationship between teachers' personal numeracy habits and instructional strategies.
H_{02}: There is no significant difference in administrators' assessments of teachers' personal numeracy habits and instructional strategies when grouped according to age, sex, highest educational attainment, and length of service.
H_{12}: There is a significant difference in administrators' assessments of teachers' personal numeracy habits and instructional strategies when grouped according to age, sex, highest educational attainment, and length of service.

METHODOLOGY

Research Design

This study employed a quantitative descriptive-correlational design with a comparative component, describing the demographic profile of administrator respondents, examining the relationship between teachers' personal numeracy habits as the independent variable and numeracy strategies as the dependent variable, and determining whether significant differences existed in assessments when grouped by demographic variables, an approach appropriate for studies that describe, relate, and compare variables without manipulation.

Population and Sampling

Participants were 30 school administrators, principals, vice principals, and department heads at Permian High School, 1800 East 42nd Street, Odessa, Texas, selected through total enumeration to ensure maximum representation of all active supervisory personnel, with inclusion requiring active administrative status and voluntary informed consent.

Research Instrument

A researcher-developed questionnaire, organized into three parts, collected data on demographic profile (Part I), teachers' personal numeracy habits across engagement with numbers, decision-making, and data analysis (Part II), and numeracy strategies across problem-solving, reasoning, and mathematical application (Part III), with Parts II and III utilizing a five-point Likert scale. Content validity was established through evaluation by five expert validators in mathematics education, educational measurement, and school administration, while internal consistency was confirmed using Cronbach's Alpha (0.82), which is acceptable for the overall instrument.

Data Collection Procedure

Following institutional approval from Permian High School and the Ector County Independent School District (ECISD), questionnaires were distributed personally to all 30 administrator respondents during the second semester of the academic year. Respondents were briefed on the study's purpose, participation was confirmed as voluntary, and all questionnaires were retrieved on the same day and checked for completeness. Data collection was completed within four weeks.

Treatment of Data

Frequency counts and percentages were used to describe the demographic profile of the respondents, while the mean was employed to determine the level of teachers' numeracy habits and strategies. The Chi-square test of independence was utilized to examine significant associations between categorical variables, and Kendall's tau-b correlation coefficient was applied to measure the relationship between variables. The Kruskal–Wallis H test was used

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to determine significant differences in teachers' assessments across age, educational attainment, and length of service groups. All statistical analyses were conducted at a 0.05 level of significance.

Ethical Considerations

Institutional approval was secured from ECISD before data collection. Participants provided written informed consent and were assured of voluntary participation, anonymity, and confidentiality. Data were used exclusively for research purposes, stored in password-protected files, and will be disposed of upon study completion. The study adhered to the ethical standards of the American Educational Research Association (AERA, 2011).

RESULTS and DISCUSSION

This section presents the results of the study and provides a comprehensive discussion based on research questions. The findings are interpreted considering established learning theories and related empirical literature to clarify the observed results.

Table 1.
Profile of the School Administrator Respondents

PROFILE	FREQUENCY	PERCENTAGE
Age		
20-24	0	0
25-29	0	0
30-34	0	0
35-39	0	0
40-44	2	7
45-49	0	0
50-54	15	50
55-59	9	30
60>	4	13
Total	30	100
Sex		
Male	13	43
Female	17	57
Total	30	100
Highest Educational Attainment		
Bachelor's Degree	0	0
with Masteral units	1	3
with MA/MS/MST degree	27	90
with EdD/PhD units	2	7
with EdD/PhD degree	0	0
Total	30	100
Length of Service		
5-9	15	50

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10-14	3	10
15-19	7	23
20-24	3	10
25-29	2	7
Total	30	100

Table 1 reveals that respondents are predominantly late-career administrators aged 50–54 (50%), with a near-equitable gender distribution (57% female, 43% male), and a highly educated cohort where 90% hold advanced degrees, while length of service is distributed across mid-to-senior ranges with the majority serving 5–9 years (50%) and 23% serving 15–19 years.

This demographic profile, characterized by advanced qualifications, substantial administrative experience, and gender balance, strengthens the credibility and validity of administrators' assessments, positioning them as informed evaluators whose perspectives are directly relevant to the design of evidence-based, numeracy-focused professional development.

Table 2.
Assessment of the School Administrators-Respondents on the Teachers' Personal Numeracy Habits and Strategies

STATEMENT	MEAN	SD	INTERPRETATION
The Mathematics teachers…			
Teachers' Personal Numeracy Habits			
2.1 Check regularly bank balances, create personal budgets, compare prices while shopping to find the best deals, and calculate monthly expenses.	3.47	0.18	Very True of The Mathematics Teachers
2.2 Use calendars effectively, planning schedules, allocating time for different tasks, and estimating how long activities will take.	3.22	0.27	Often True of The Mathematics Teachers
2.3 Follow recipes accurately, converting units of measurement (cups to grams), scaling recipes up or down based on portion sizes.	3.30	0.27	Very True of The Mathematics Teachers
2.4 Track personal metrics like exercise progress, sleep patterns, or calorie intake using apps or spreadsheets, interpreting data to make informed decisions.	3.27	0.28	Very True of The Mathematics Teachers
2.5 Perform simple calculations mentally, like adding up a grocery bill quickly, estimating distances, or quantities.	3.25	0.26	Very True of The Mathematics Teachers
2.6 Measure dimensions for DIY projects, calculating needed materials, and understanding unit costs.	3.30	0.27	Very True of The Mathematics Teachers
Sub Mean	**3.30**	**0.26**	**Very True of The Mathematics Teachers**
Teachers' Strategies in Teaching Mathematics			
2.7 Start with physical activities, then move to pictorial, and finally symbolic.	3.30	0.27	Very True of The Mathematics Teachers
2.8 Provide students with visual depictions of math problems to help them understand the quantities and relationships involved.	3.25	0.26	Very True of The Mathematics Teachers

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2.9 Provide clear, structured instructions, including sample problems, and check answers.	3.27	0.28	Very True of The Mathematics Teachers
2.10 Start with exposing students to math at a young age to help prevent them from developing a negative attitude towards math.	3.42	0.21	Very True of The Mathematics Teachers
2.11 Provide feedback to students that highlights their strengths and weaknesses.	3.30	0.27	Very True of The Mathematics Teachers
2.12 Give each student a piece of a puzzle to help reluctant students participate.	3.05	0.16	Often True of The Mathematics Teachers
2.13 Set goals that are specific, measurable, attainable, relevant, and time-bound.	3.22	0.22	Often True of The Mathematics Teachers
2.14 Involve students in classroom dialogue and encourage them to explain their reasoning.	3.42	0.21	Very True of The Mathematics Teachers
2.15 Teach the students how to use spreadsheets to analyze and visualize data, and create graphs and charts to represent mathematical concepts.	3.30	0.27	Very True of The Mathematics Teachers
Sub Mean	**3.28**	**0.24**	**Very True of The Mathematics Teachers**
OVERALL MEAN	**3.29**	**0.25**	**Very True of The Mathematics Teachers**

Range:
4.00-3.25 *Very True of The Mathematics Teachers*
3.24-2.50 *Often True of The Mathematics Teachers*
2.49-1.75 *Sometimes True of The Mathematics Teachers*
1.74-1.00 *Least True of The Mathematics Teachers*

Note: Administrator Evaluator = 30
Total Teachers evaluated by 30 administrators = 1,050 (30 X 35)

The findings in Table 2 indicate that teachers demonstrate highly evident personal numeracy habits and instructional strategies, suggesting that numeracy extends beyond a purely cognitive skill and is reflected in routine professional and everyday practices. This pattern implies that teachers who regularly engage in real-world numeracy activities may be more inclined to integrate similar applications into their classroom instruction, thereby fostering more meaningful learning experiences for students. Rather than merely reflecting competence, the results suggest that habitual engagement with numeracy shapes how teachers approach instructional design and delivery.

These findings are consistent with the work of Nurwan et al. (2025), who reported that teachers' involvement in authentic numeracy activities is associated with improved instructional practices. In the same vein, Díez-Palomar et al. (2023) emphasize that constructivist and inquiry-based approaches grounded in real-world contexts are associated with enhanced mathematical understanding among learners. The present study aligns with these perspectives and further suggests that teachers' personal numeracy habits are closely associated with the instructional strategies they employ. This relationship may reflect an underlying mechanism in which teachers draw from their own experiences with numeracy when facilitating learning, thereby reinforcing the connection between personal practice and pedagogical approach.

From a pedagogical perspective, the slightly lower ratings in individualized engagement and goal setting suggest areas for targeted professional development. Teachers may benefit from training programs that strengthen differentiated instruction and strategic planning in numeracy teaching.

For school leaders, these findings underscore the importance of supporting professional development initiatives that integrate personal numeracy and instructional strategies. For curriculum developers, the results suggest the need to embed real-world numeracy applications into curriculum frameworks. For teacher education programs, the

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findings highlight the importance of preparing future teachers to model numeracy practices in both personal and instructional contexts.

Table 3
Relationship Between Teachers' Personal Numeracy Habits and Strategies in Teaching Mathematics

ASSESSMENT	SA (N)	AT (N)	DF	CHI SQUARE	KENDALL TAU TEST	P VALUE	REMARKS	
Age	30	35	1	28.234	.897	4.18E-08	Very strong positive correlation	Reject Ho
Sex	30	35	1	28.976	.922	4.32E-08	Very strong positive correlation	Reject Ho
Highest Educational Attainment	30	35	1	19.200	0.640	1.18E-05	High positive correlation	Reject Ho
Length of Service	30	35	1	13.333	0.444	.0003	Moderate positive correlation	Reject Ho

Level of Significance <.05
**SA (N) – School Administrator*
**AT (N) – Assessed Teachers by the administrators*

Table 3 reveals consistently significant positive correlations between teachers' personal numeracy habits and instructional strategies across all demographic subgroups ($p < 0.05$), with coefficients ranging from moderate for length of service ($\tau = 0.444$) to educational attainment ($\tau = 0.640$), age ($\tau = 0.897$), and sex ($\tau = 0.922$). These results indicate a strong and consistent association between teachers' habitual engagement with numeracy and the strategies they employ in instruction, across demographic groups. The relatively lower correlation for length of service suggests that increased years of teaching experience do not necessarily correspond to a stronger alignment between personal numeracy habits and instructional practices, implying that experience alone may not be sufficient to deepen this relationship.

These findings are consistent with previous studies (Díez-Palomar et al., 2023; Foster, 2023; Getenet, 2022; Weinhandl et al., 2025), which highlight the importance of active engagement with numeracy in shaping instructional approaches. Rather than indicating a direct causal effect, the results suggest that personal numeracy habits are closely associated with instructional quality and may contribute to how teachers design and implement numeracy-related learning experiences. The strength of the relationships across subgroups may also reflect similarities in professional contexts or shared training experiences among respondents. Overall, the findings support the view that numeracy functions as an evolving professional competency, continually developed through practice and engagement, rather than a fixed skill determined solely by formal qualifications or years of service.

For administrators, curriculum developers, and policymakers, numeracy habit assessment must be embedded within teacher evaluation frameworks aligned with Texas Essential Knowledge and Skills (TEKS) and TEA standards, while differential correlations across career stages necessitate differentiated professional development that integrates authentic numeracy tasks into professional learning communities as a high-leverage strategy for advancing pedagogical innovation.

Table 4
Significant Difference in the Assessment of the School Administrator-Respondents, When Grouped Accordingly

ASSESSMENT	SA (N)	TA (N)	DF	KRUSKALL WALLIS TEST	P-VALUE	REMARKS
Age	30	35	1	45.135	1.84E-11	Reject Ho
Sex	30	35	1	0.915	1.40E-11	Reject Ho
Highest Educational Attainment	30	35	1	32.291	1.33E-08	Reject Ho

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Length of Service	30	35	1	18.197	1.99E-05	Reject Ho

Level of Sig. <.05
**Mann Whitney-U Test*

Table 4 demonstrates statistically significant differences in administrators' assessments of teachers' numeracy habits and strategies across all demographic variables, such as age, sex, educational attainment, and length of service ($p < 0.05$), leading to the rejection of all null hypotheses. These findings suggest that evaluative judgments are associated with administrators' demographic and professional backgrounds rather than being uniformly applied. This pattern may indicate that administrators draw on their own experiences, expectations, and professional orientations when assessing teachers' practices, leading to variations in how numeracy habits and instructional strategies are perceived and evaluated across different groups.

Without standardized evaluation protocols, these demographic differences risk producing inconsistent and inequitable assessments of teachers' numeracy competencies, as structured, training-informed frameworks have been shown to significantly improve the consistency and developmental utility of administrator feedback (Poulou et al., 2023).

For policymakers and curriculum developers, administrator preparation programs must explicitly address evaluator demographic variability as a threat to appraisal validity, integrating numeracy-specific evaluation rubrics and inter-rater reliability training within professional development frameworks aligned with TEKS and campus improvement plans to ensure standardized, pedagogically purposeful assessments across all career stages.

Conclusions

Based on the findings of the study, it is concluded that teachers demonstrate strong personal numeracy habits and effective instructional strategies, indicating that numeracy competence extends beyond classroom instruction into real-life practice. The significant positive relationship between numeracy habits and instructional strategies confirms that teachers who actively engage in numeracy in their daily lives are more likely to employ effective teaching strategies.

The study also reveals that administrators' assessments vary significantly across demographic characteristics, highlighting the influence of professional background and experience on evaluation practices. These findings contribute to educational research by emphasizing the integration of personal numeracy and pedagogy as a key component of effective teaching.

Furthermore, the study contributes to teaching and learning improvement by identifying areas for enhancing instructional practices, supports educational leadership through insights into evaluation systems, and informs teacher professional development by emphasizing the need for continuous numeracy engagement.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Teacher education institutions and training providers may integrate personal numeracy practices with instructional strategies in professional development programs to strengthen both real-life application and classroom instruction.
2. Professional development initiatives may focus on enhancing individualized instruction and goal-setting strategies to improve teaching effectiveness in mathematics.
3. School administrators may adopt standardized evaluation frameworks to promote consistency, objectivity, and fairness in assessing teachers' competencies.
4. Educational leaders and policymakers may design capacity-building programs for school administrators to improve evaluation practices across diverse demographic contexts.
5. Curriculum developers may incorporate real-world numeracy applications into curriculum design to strengthen the connection between theory and practice in mathematics education.
6. Future researchers may explore additional variables, such as school environment, instructional quality, and teacher beliefs, to further understand factors influencing numeracy practices.

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