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ORIGINAL ARTICLE

Teacher performance and the development of mathematical competencies in sixth-grade primary education

Desempeño docente y desarrollo de competencias matemáticas en sexto grado de educación primaria

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Abstract

The present study aimed to describe the correspondence between classroom teaching performance and the development of mathematical competencies among sixth-grade primary school students. A quantitative, observational, cross-sectional, and descriptive design was employed, involving a non-probabilistic sample of 13 teachers and 395 students from public primary schools in School District 095 in Tampico, Tamaulipas, Mexico. Both variables were assessed using structured observation instruments organized into four-level ordinal scales, aligned with national curricular standards. Data analysis was conducted using descriptive statistics, including frequencies, overall performance levels, and patterns of correspondence. The results indicated that teaching performance was predominantly concentrated at the "good" level, whereas students' mathematical competencies were mostly classified at the "elementary" level. Although a descriptive trend of correspondence between the two variables was observed, the findings do not allow for the establishment of a statistical association or causal relationship. It is concluded that teaching performance represents a relevant component for understanding the development of mathematical competencies; however, the results should be interpreted with caution due to the methodological limitations of the study.

Keywords: teaching performance; mathematical competencies; primary education; sixth grade; descriptive analysis

Resumen

El presente estudio tuvo como propósito describir la correspondencia entre el desempeño docente en el aula y el desarrollo de competencias matemáticas en estudiantes de sexto grado de educación primaria. Se realizó una investigación cuantitativa, observacional, transversal y descriptiva, con una muestra no probabilística de 13 docentes y 395 estudiantes de escuelas primarias públicas de la Zona Escolar 095 de Tampico, Tamaulipas. Ambas variables fueron evaluadas mediante instrumentos estructurados de observación, organizados en escalas ordinales de cuatro niveles de logro y alineados con referentes curriculares nacionales. El análisis se efectuó mediante estadística descriptiva, considerando frecuencias, niveles globales de desempeño y tendencias de correspondencia. Los resultados mostraron que el desempeño docente se concentró principalmente en el nivel "bueno", mientras que las competencias matemáticas de los estudiantes se ubicaron mayoritariamente en el nivel "elemental". Aunque se observó una tendencia descriptiva de correspondencia entre ambas variables, los hallazgos no permiten establecer asociación estadística ni relación causal. Se concluye que el desempeño docente es un componente relevante para comprender el desarrollo de competencias matemáticas; no obstante, los resultados deben interpretarse con cautela por las limitaciones metodológicas del estudio.

Palabras clave: desempeño docente; competencias matemáticas; educación primaria; sexto grado; análisis descriptivo

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INTRODUCTION

The development of mathematical competencies in primary education represents one of the major challenges faced by contemporary educational systems, particularly in sixth grade, a stage during which students consolidate foundational learning and acquire the skills necessary to successfully navigate subsequent levels of education. Numerous studies have demonstrated that teaching quality and teacher performance significantly influence student learning outcomes, especially when pedagogical practices promote complex cognitive processes such as mathematical reasoning, argumentation, modeling, and problem-solving (Darling-Hammond et al., 2020; Hattie, 2017).

Within this context, teacher performance has gained increasing prominence in competency-based curricular approaches, which advocate educational practices centered on active learning, student engagement, and the meaningful construction of knowledge. From this perspective, mathematical competencies are understood as the ability to mobilize knowledge, skills, and attitudes to address and solve problems across diverse contexts, extending beyond the mere mechanical application of procedures or algorithms (Niss & Højgaard, 2019; Kilpatrick et al., 2016). Strengthening these competencies is essential not only for students' future academic achievement but also for their effective participation in social and professional life, as evidenced by large-scale international assessments such as the Programme for International Student Assessment (PISA) (OECD, 2019).

Mathematics education has undergone significant transformation over recent decades. Traditional content-centered models have progressively given way to pedagogical approaches that emphasize interaction, reflection, argumentation, and the social construction of knowledge. This shift has redefined the role of teachers, who now function as facilitators and mediators of learning, fostering educational environments that support the development of competencies and higher-order mathematical thinking (Hill et al., 2005; Muijs et al., 2014). In this regard, a growing body of research has documented that factors such as subject-matter expertise, pedagogical content knowledge, and the implementation of appropriate instructional strategies are associated with improved mathematics learning outcomes (Blömeke et al., 2016).

Despite these theoretical and empirical advances, important questions remain regarding how teacher performance manifests within specific educational contexts and how it relates to the development of students' mathematical competencies. Although the international literature has provided substantial evidence on this topic, there remains a limited body of research situated within local primary education settings that can elucidate these dynamics in light of the particular conditions characterizing each educational environment. In the case of School District 095 of primary education, located in Tampico, Tamaulipas, a need has been identified for systematic information that would allow the assessment of teacher performance levels and the

degree of mathematical competency development among sixth-grade students.

The importance of this issue lies in the fact that institutional initiatives aimed at teacher training and professional development are generally based on professional performance standards whose impact on student learning must be documented through contextually grounded empirical evidence. Furthermore, several authors have emphasized that the assessment of both teacher performance and student competencies requires rigorous procedures and technically sound instruments in order to generate valid information for educational decision-making (Shavelson, 2018; Pellegrino & Hilton, 2013).

Accordingly, the following research question arises: What are the levels of teacher performance and mathematical competency development among sixth-grade primary school students belonging to School District 095? Addressing this question is relevant for understanding the educational conditions of the context under study and generating evidence that may inform pedagogical improvement processes.

Therefore, the objective of the present study is to describe the levels of teacher performance and mathematical competency development among sixth-grade primary school students and to explore the observed correspondence between these variables through a systematic process of contextualized data collection and analysis.

METHODS, TECHNIQUES AND INSTRUMENTS

This study was conducted using a quantitative approach with an observational, cross-sectional, and descriptive design. The research aimed to describe the levels of teacher performance and the development of mathematical competencies among sixth-grade primary school students, as well as to explore the observed correspondence between these variables within a specific educational context. Given the nature of the design, no instructional interventions were implemented, and no comparison groups were established.

The study population consisted of sixth-grade teachers and students enrolled in public primary schools within School District 095, located in Tampico, Tamaulipas, Mexico. A non-probability purposive sampling strategy was employed, based on accessibility and pedagogical relevance criteria. The sample included 13 classroom teachers and a total of 395 students. Sixth grade was selected because of its importance in consolidating fundamental mathematical learning prior to students' transition to secondary education.

The teacher performance variable was conceptualized as the set of pedagogical practices implemented by teachers to support student learning. To measure this variable, a structured observation instrument was developed in the form of a double-entry matrix comprising 25 indicators distributed across five dimensions: lesson planning, learning environment management, curriculum management,

instructional management, and assessment. Each indicator was rated using a four-level ordinal scale: insufficient, basic, good, and excellent. The sum of the scores obtained allowed the determination of an overall teacher performance level for each participant.

Mathematical competencies were defined as students' ability to mobilize knowledge, skills, and attitudes to solve problem situations in a variety of contexts. Assessment was conducted using a second structured observation instrument organized around four dimensions: autonomous problem solving, communication of mathematical information, validation of procedures and results, and efficient use of techniques. As with the previous instrument, a four-level ordinal achievement scale was applied. The aggregated scores were used to determine an overall level of mathematical competency development for each classroom group.

Data collection was carried out through direct observation of teaching practices and students' performance during academic activities conducted in face-to-face and/or virtual settings. This process was complemented by the review of learning evidence produced during the study period. Each teacher and the corresponding group of students were observed on a single assessment occasion in order to obtain descriptive information regarding the variables under investigation.

The instruments were developed based on regulatory frameworks and pedagogical criteria established by the Mexican Ministry of Education for basic education. However, no formal psychometric validation procedures or statistical reliability estimates were performed. This limitation should be acknowledged when interpreting the study findings.

Data analysis was conducted using descriptive statistics. Frequencies, percentages, and overall achievement levels were calculated for each variable to characterize teacher performance and the development of mathematical competencies within the study population. Subsequently, a descriptive comparison of the levels achieved in both variables was performed to identify patterns of observed correspondence across the analyzed cases.

Owing to the small teacher sample size, the ordinal nature of the measurement scales, and the non-probability sampling method employed, no inferential statistical analyses were conducted. Consequently, the findings should be interpreted as context-specific descriptive evidence rather than as conclusive statistical associations.

RESULTS AND DISCUSSION

The analysis of the data provided a descriptive characterization of teacher performance levels and the development of mathematical competencies among sixth-grade primary school students from School District 095. The findings related to teacher performance indicated that most of the teachers evaluated achieved achievement levels classified as good, according to the criteria established in the observation instrument. Overall, the pedagogical

practices observed demonstrated an acceptable degree of compliance with the curricular standards considered in the evaluation process. A summary of the results obtained is presented in Figure 1.

To determine overall achievement levels, an aggregation procedure was applied to the scores obtained across the different indicators assessed. The score ranges used for classifying these levels are presented in Figure 2. Based on this classification, the overall level of teacher performance was situated within the good category. In contrast, the analysis of mathematical competency development revealed that the predominant achievement level was basic, indicating that students demonstrated partial progress in the competencies evaluated without consistently reaching the higher proficiency levels established for their grade.

A comparison of the two variables revealed differences in the overall achievement levels attained. Whereas teacher performance was primarily concentrated in the good category, the development of mathematical competencies was predominantly classified at the basic level. Nevertheless, correspondence between the levels achieved in both variables was observed in eight of the thirteen cases analyzed. A summary of these findings is presented in Figure 3.

To further examine variations across cases, a comparison was conducted between the performance level attained by each teacher and the corresponding level of mathematical competency development demonstrated by their respective student group. Figure 4 illustrates the agreements and discrepancies identified between the two variables.

The descriptive analysis showed that correspondence between teacher performance and students' mathematical competencies was more frequently observed in cases where teachers achieved performance levels classified as good or excellent. At the same time, several cases were identified in which teacher performance levels exceeded the levels of mathematical competency development attained by students. This finding highlights differences between the assessment of observed pedagogical practices and the learning outcomes demonstrated by students.

Regarding the dimensions that comprised teacher performance, lesson planning obtained the highest achievement levels, whereas assessment practices received the lowest scores. In particular, indicators related to self-assessment, peer assessment, and feedback provision emerged as areas requiring further strengthening when compared with the other components evaluated..

Levels: 1 = insufficient 2 = elementary 3 = good 4 = excellent

DOMAIN	CONTENT / SCORE BY RATER	TEACHER PERFORMANCE LEVELS IN THE CLASSROOM												TOTAL	
		RATER 1	RATER 2	RATER 3	RATER 4	RATER 5	RATER 6	RATER 7	RATER 8	RATER 9	RATER 10	RATER 11	RATER 12	Reference Score	Rubric Average
Planning	*I Content*	3	4	3	3	3	4	3	2	4	4	4	4	44	42.5
	II Purpose Selection	3	3	2	3	3	4	3	2	4	4	4	4	42	
	III Design of didactic strategies	4	3	2	4	2	4	3	2	4	4	4	4	43	
	IV Evaluation mechanisms	3	3	2	3	3	4	3	1	4	4	4	4	41	
Classroom Environment Management	*V Interpersonal relationships*	2	4	2	2	2	2	3	3	2	2	3	2	31	32.5
	VI Group management	3	3	2	3	2	2	4	3	2	2	3	3	34	
Curriculum Management	*VII Knowledge of the curriculum*	3	3	2	3	2	2	3	2	3	3	3	3	35	32.3
	VIII Relationships between subjects	3	3	2	3	2	2	3	2	3	2	2	2	31	
	IX Connections between subjects – contexts	3	3	2	3	2	2	3	2	3	2	2	2	31	
Instructional Management	*X Curriculum presentation*	2	3	2	2	2	3	3	2	2	3	3	2	31	35.25
	XI Differentiated instruction	2	2	2	2	4	3	2	2	2	2	2	2	29	
Resources and Classroom Processes	*XII Group organization*	3	3	2	3	2	2	3	2	3	2	3	2	33	35.0
	XIII Student learning relationship	3	3	2	3	2	3	3	2	3	2	3	3	35	
	XIV Didactic resources	3	2	2	3	2	3	2	2	3	2	4	4	34	
	XV Spatial resources	4	3	2	4	2	3	2	2	4	2	4	2	36	
	XVI Time management	4	3	2	4	3	4	2	1	3	3	4	3	39	
	XVII Indicators	4	3	2	4	3	3	4	2	3	3	2	2	38	
	XVIII Explanations	4	3	2	4	3	3	4	2	3	3	2	3	39	
	XIX Questions	4	3	3	4	3	2	4	2	3	3	4	4	43	
	XX Guided activities	2	3	2	2	3	3	3	2	2	2	2	2	31	
	XXI Independent activities	2	3	2	2	4	3	2	0	2	2	4	4	32	
Assessment	*XXII Self-assessment*	2	3	0	2	3	2	2	0	2	3	3	3	27	30.5
	XXIII Peer assessment	3	3	2	3	3	2	2	0	2	2	3	2	30	
	XXIV Teacher assessment of students	2	3	2	2	3	2	2	2	2	2	3	3	31	
	XXV Feedback of knowledge	3	2	2	3	2	3	4	1	3	2	3	3	34	
Total score per rater		74	74	50	74	65	70	72	43	71	65	78	72	66	
Overall performance level of each teacher		3	3	2	3	3	3	3	2	3	3	4	3	3	

Total number of items: 25

Level achieved according to the score obtained

Ranges:

Level 1 = insufficient: 0 – 25 points Level 2 = elementary: 26 – 50 points

Level 3 = good: 51 – 75 points Level 4 = excellent: 76 – 100 points

Figure 1. *Summary of teacher performance assessment results*

Teacher Performance

Teachers	TEACHER 1	TEACHER 2	TEACHER 3	TEACHER 4	TEACHER 5	TEACHER 6	TEACHER 7	TEACHER 8	TEACHER 10	TEACHER 11	TEACHER 12	TEACHER 13	FINAL RESULT	
													Average Total Score	Achievement Level
Achievement level in teacher performance	3	3	2	3	3	3	2	2	3	4	3	3	38	3: Good

Students' Mathematical Competencies

Teachers	TEACHER 1	TEACHER 2	TEACHER 3	TEACHER 4	TEACHER 5	TEACHER 7	TEACHER 8	TEACHER 9	TEACHER 10	TEACHER 11	TEACHER 12	TEACHER 13	FINAL RESULT	
													Total Score	Achievement Level
Average achievement level in students' mathematical competencies	2	3	2	3	3	2	3	1	3	4	3	1	33	2: Elementary

Scoring Ranges:

Level 1 = insufficient: 0 – 25 points Level 2 = elementary: 26 – 38 points Level 3 = good: 27 – 39 points

Level 4 = excellent: 40 – 52 points

Figure 2. *Achievement Levels*

Teacher Performance

Teachers	TEACHER 1	TEACHER 2	TEACHER 3	TEACHER 4	TEACHER 5	TEACHER 6	TEACHER 7	TEACHER 8	TEACHER 9	TEACHER 10	TEACHER 12	TEACHER 13	FINAL RESULT	
													Average Total Score	Achievement Level
Achievement level in teacher performance	3	3	2	3	3	3	3	2	3	4	3	3	38	3: Good

Students' Mathematical Competencies

Teachers	TEACHER 1	TEACHER 2	TEACHER 3	TEACHER 4	TEACHER 6	TEACHER 7	TEACHER 8	TEACHER 9	TEACHER 10	TEACHER 11	TEACHER 12	TEACHER 13	FINAL RESULT	
													Total Score	Achievement Level
Average achievement level in students' mathematical competencies	2	3	2	3	3	2	3	1	3	4	3	1	33	2: Elementary

Scoring Ranges:

Level 1 = insufficient: 0 – 25 points Level 2 = elementary: 26 – 38 points Level 3 = good: 27 – 39 points

Level 4 = excellent: 40 – 52 points

Figure 3. *Final summary of teacher performance and mathematical competency development results*

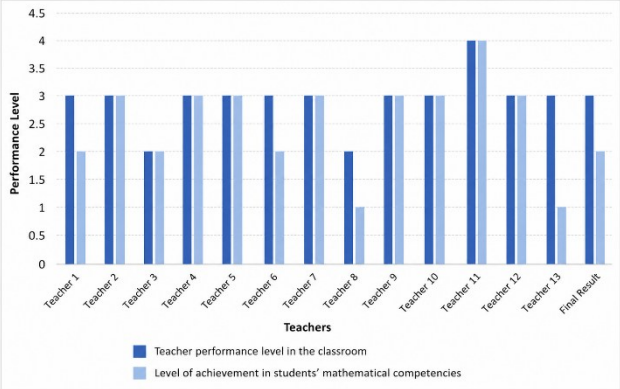

Figure 4. *Variations across individual cases*

The results indicate that teacher performance was predominantly concentrated at a good achievement level, whereas the development of mathematical competencies was largely classified as basic. This finding is consistent with the specialized literature, which recognizes the importance of pedagogical practices in learning processes while emphasizing that academic achievement is also shaped by multiple factors associated with the school, family, and sociocultural context (Hattie, 2017; Muijs et al., 2014).

The correspondence observed between teacher performance levels and the development of mathematical competencies in most of the cases analyzed represents a relevant finding within the context under study. Although the descriptive nature of the research design precludes the establishment of conclusive statistical associations, the results suggest that groups taught by teachers who attained higher performance levels tended to demonstrate more favorable levels of mathematical competency development. This trend is consistent with previous research highlighting the influence of pedagogical content knowledge, instructional planning, and teacher mediation on mathematics learning outcomes (Hill et al., 2005; Blömeke et al., 2016).

Nevertheless, the findings also reveal a gap between the overall level of teacher performance and the level of mathematical competencies achieved by students. While teaching practices were generally rated as good, the development of mathematical competencies remained within the basic category. This discrepancy may indicate that the implementation of practices aligned with curricular standards does not, by itself, guarantee the consolidation of complex learning outcomes, particularly when additional factors related to student characteristics, institutional conditions, and pedagogical support processes are involved.

Another noteworthy aspect concerns the differentiated performance across the dimensions of teacher evaluation. Lesson planning received the most favorable ratings, whereas assessment practices obtained the lowest scores. These results are consistent with studies reporting persistent challenges in the incorporation of formative assessment strategies, self-assessment, and peer assessment within basic education settings (Shavelson, 2018; Sanmartí, 2008).

Because the development of mathematical competencies requires processes of reflection, argumentation, and validation of procedures, the weaknesses identified in assessment practices may limit students' progression toward higher levels of achievement.

Furthermore, the variability observed among teachers and classroom groups reinforces the view of mathematics learning as a multidimensional and complex phenomenon. The presence of cases in which relatively high levels of teacher performance were accompanied by lower levels of student mathematical competencies suggests the possible influence of factors not examined in the present study, such as students' socioeconomic conditions, the availability of educational resources, family involvement, and characteristics of the school environment.

CONCLUSIONS

This study described the levels of teacher performance and mathematical competency development among sixth-grade primary school students enrolled in School District 095, providing context-specific empirical evidence through an observational and descriptive approach. The findings revealed that teacher performance was predominantly concentrated at a good achievement level, whereas mathematical competency development was largely situated within the basic category, highlighting opportunities for improvement in the teaching and learning of mathematics.

The results also identified a pattern of correspondence between teacher performance levels and students' mathematical competency development in most of the cases analyzed. However, given the methodological characteristics of the study, this correspondence should be interpreted solely as a context-specific descriptive trend rather than as evidence of a statistically validated association.

The findings suggest that efforts to strengthen teacher performance should address not only lesson planning and mastery of curricular content but also the consolidation of formative assessment practices aimed at promoting reflection, continuous feedback, and self-regulated learning. In this regard, the results help identify specific areas that may benefit from targeted professional development, instructional support, and ongoing teacher training initiatives.

Finally, it is important to acknowledge that limitations related to the sample size, the non-probability sampling strategy, the absence of formal instrument validation and reliability procedures, and the exclusive use of descriptive statistics constrain the scope of the conclusions. Nevertheless, the evidence generated provides a valuable reference for future research seeking to advance the study of teacher performance and mathematics learning through more robust methodological designs, larger samples, psychometrically validated instruments, and statistical analyses capable of examining the nature of the relationship between these variables with greater precision.

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