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Mediating Effect of Pedagogical Competence of Teachers on the Attitudes – Academic Achievement Correlation

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Abstract. Poor academic achievement in Mathematics is alarming. This study aimed to determine the significance of the mediating effect of pedagogical competence of teachers on the relationship between attitude and academic achievement of students in mathematics. Using mediation analysis, involving 180 samples selected through simple random sampling, it was revealed that the interest variable does not significantly mediate (path a, p=0.186 and path b, p=0.118) the correlation between the predictive and criterion variables. Hence, the Social Cognitive Theory (SCT) was objected. Further research may be undertaken to validate the conclusion of this study and test the strength of the theory.

KEY WORDS

1. Mediating effect of pedagogical competence of teachers, 2. relationship between attitudes and academic achievement 3. students in mathematics

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1. Introduction

Poor achievement in mathematics is a global concern. In the Philippines, the Program for International Student Assessment (PISA) revealed that students can only perform basic mathematical tasks, with less than 1 able to handle complex problem-solving (OECD, 2019). Mathematics is often perceived as one of the most difficult subjects, leading to consistently low academic performance (Algani Eshan, 2019). Similar challenges exist in South Africa, where poor math performance prevents students from progressing to the next grade (Mabena, Mokgosi, Ramapela, 2021), and in Fiji, where a lack of interest and insufficiently trained primary school teachers contribute to low achievement (Chand et al., 2021). In the Philippines, Capuno et al. (2019) highlighted the country's poor ranking in math and science education, ranking 79th out of 138 countries in the Global Competitiveness Report. Additionally, the National Achievement Test (NAT) showed a mean percentage score of 48.63 in mathematics, falling below the Department of Education's (DepEd) threshold of 50 (Peteros et al., 2019). Factors such as low cognitive skills, lack of research, and poor living standards further contribute to this issue (Bamidele, 2019). Given the scarcity of research on low math achievement, this study aims to investigate its underlying causes.

1.1. Statement of the Problem—This study examines the mediating effect of teachers' pedagogical competence on the relationship between students' attitudes and academic achievement in Mathematics. It specifically aims to assess students' attitudes, academic performance, and perceived teacher competence; analyze the sig-

nificance of their relationships; and determine whether pedagogical competence mediates the link between attitude and achievement in Mathematics. This study tests two hypotheses at a 0.05 significance level: (1) students' attitudes toward learning mathematics and teachers' pedagogical competence, as perceived by students, are not significantly correlated with academic achievement (Ho1), and (2) teachers' pedagogical competence does not significantly mediate the relationship between students' attitudes and their academic achievement (Ho2).

1.2. Theoretical Framework—Social Cognitive Theory (SCT), developed by Albert Bandura, explains how people (personal factors), their behaviors, and their environments interact and influence one another. This interaction, called Reciprocal Determinism (Rana Dwivedi, 2015), highlights the continuous cycle of influence between personal factors, environmental factors, and behavior. Personal factors include an individual's attitudes, beliefs, and cognitive abilities, such as students' attitudes toward learning mathematics, which affect their motivation and learning (Abdullah, 2019). Environmental factors involve physical and social aspects, such as teachers' teaching skills, which create opportunities and impact students' success (Anwar, Rehman, Wang, Hashmani, Shamim, 2019). Behavior, shaped by observing, imitating, and learning from others, reflects students' ability to control their actions and achieve desired outcomes, like better performance in math (Hebert-Beirne, et al., 2021) (Iannone, Annunziata, Rizzi, Frey, 2023).

2. Methodology

2.1. Research Design—This study utilized a non-experimental quantitative research design with a correlational approach to examine the relationship between students' attitudes toward learning mathematics and their academic achievement. Mediation analysis was conducted to assess whether pedagogical competence influenced this relationship. Data were collected using a descriptive survey method with structured questionnaires.

2.2. Research Respondents—The study was conducted in Cluster 4 Junior High Schools within the Division of Davao City, covering 12 schools, including integrated schools. A total of 180 Grade 9 students were selected through simple random sampling, ensuring representativeness. The sample size was determined using Raosoft, Inc.'s calculator, following standard reliability guidelines.

2.3. Research Instrument—Three research instruments were adapted: the Attitude Toward Learning Mathematics Scale by Yin Fishbein (2019), which measured attitudes based on Liking, Valuing, and Confidence in Mathematics; first-quarter Mathematics 9 test scores from the Department of Education to assess academic achievement; and Adegbola's (2019) Pedagogical Competence Scale, which evaluated teachers' effectiveness through instructional material use, subject knowledge, motivation, communication, and teaching style. A 5-point Likert scale was used for responses.

2.4. Data Gathering Procedure—To ensure validity and reliability, expert validation and pilot testing were conducted, with reliability assessed using Cronbach's alpha. Ethical considerations included informed consent from parents, assent from minors, confidentiality, and adherence to the Data Privacy Act of 2012. The study was approved by the HCDC-REC and DOST-PHREB ethics committees. Data collection involved securing permissions from edu-

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cational authorities, distributing consent forms, and administering surveys. Statistical analysis included mean calculations to determine students' attitudes, academic achievement, and perceived teacher competence. Pearson's Product-Moment Correlation Coefficient measured relationships between variables, while mediation analysis based on Preacher and Hayes' approach evaluated the role of pedagogical competence.

2.5. Data Analysis—This research employed rigorous methodologies to ensure reliability, validity, and ethical integrity, contributing valuable insights into the impact of student attitudes and teacher competence on mathematics achievement.

3. Results and Discussion

The study examined the relationship between junior high school students' attitudes toward learning mathematics, their academic achievement, and their perceptions of their teachers' pedagogical competence. The findings are categorized into descriptive, correlation, and mediation analyses.

3.1. Descriptive Analysis—The study examined students' attitudes toward learning mathematics based on valuing mathematics, liking mathematics, and confidence in mathematics. Results showed that students highly value mathematics (M = 4.10), like the subject (M = 3.97), but have moderate confidence in it (M = 3.58). Overall, their attitude toward learning mathematics was high (M = 3.89, SD = 0.30). However, their academic achievement was low (M = 2.11, SD = 0.73), indicating struggles despite a positive attitude. Teachers' pedagogical competence, as perceived by students, was also assessed through communication style, motivation, subject knowledge, instructional material use, and teaching style. Communication style received the highest rating (M = 4.15), while teaching style was the lowest (M = 3.88). Overall, teachers' pedagogical competence was rated high (M = 4.03, SD = 0.43).

Table 1. Descriptive Table

Variables	SD	Mean	Descriptive Level
Attitude of Students toward Learning Mathematics	0.30	3.89	High
Academic Achievement	0.73	2.11	Low
Pedagogical Competence of Teachers as Perceived by the Students	0.43	4.03	High

3.2. Correlation Analysis—The study explored the relationship between students' attitudes toward learning mathematics and their academic achievement, revealing a weak but statistically significant positive correlation (r = 0.287, p = 0.000). This suggests that students with a more positive attitude toward mathematics tend to perform slightly better academically. Conversely, the correlation between the perceived pedagogical competence of teachers

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and students' academic achievement showed a weak negative correlation (r = -0.172, p = 0.021). This suggests that students' perceptions of their teachers' competence do not necessarily translate into improved academic performance in mathematics.

Table 2. Correlation Table: Academic Achievement of Junior High School Students in Mathematics

Variables	r	p-value	Decision on H_0 at 0.05 Level	Interpretation
Attitudes of Junior High School Students toward Learning Mathematics	0.287	0.000	Reject H_0	Significant
Pedagogical Competence of Teachers as Perceived by the Students	-0.172	0.021	Reject H_0	Significant

3.3. Mediation Analysis—The study further investigated whether the perceived pedagogical competence of teachers mediated the relationship between students' attitudes toward learning mathematics and their academic achievement. The mediation analysis showed that the direct effect of students' attitudes on academic achievement was significant (B = 0.636, p = 0.006), meaning that a positive attitude toward mathematics directly contributes to better academic performance. However, the analysis found no significant indirect effect of pedagogical competence in mediating this relationship (B = 0.043, p = 0.349). The findings suggest that while students' attitudes toward mathematics are a significant predictor of their achievement, their perceptions of teacher competence do not significantly mediate this relationship.

4. Conclusions and Recommendations

4.1. Findings—The study concluded that students generally have a positive attitude toward learning mathematics, and they perceive their teachers as highly competent. However, their academic achievement in mathematics remains low. A significant but weak positive relationship was found between students' attitudes and academic achievement, while a weak negative relationship was found between perceived teacher competence and student achievement. Furthermore, pedagogical competence did not mediate the relationship between students' attitudes and academic achievement. These findings highlight the need for interventions that not only enhance students' attitudes but also address instructional strategies to improve academic performance in mathematics.

4.2. Conclusions—The study concluded that students' attitudes toward mathematics significantly impact their academic achievement, but teachers' pedagogical competence does not mediate this relationship. Surprisingly, peda-

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Table 3. Path Estimates

Path	Estimate	S.E.	C.R.	P-value
Mediation				
Attitude of Junior High School Students Toward Learning Mathematics → Pedagogical Competence of Teachers (a)	-0.190	0.114	-1.32	0.186
Not Significant				
Pedagogical Competence of Teachers → Academic Achievement in Mathematics (b)	-0.227	0.146	-1.56	0.118
Not Significant				
Attitude of Junior High School Students Toward Learning Mathematics → Academic Achievement in Mathematics (c')	0.636	0.231	2.75	0.006
Significant				
Conclusion: No Mediation				

gogical competence showed a negative correlation with achievement, challenging the assumptions of Social Cognitive Theory (Bandura, 1986), which posits that behavior, personal factors, and environmental influences interact dynamically.

4.3. Recommendations—Given the findings, the study suggests that educational initiatives should focus on improving students' attitudes and confidence in mathematics rather than solely on teacher proficiency. This aligns with Sustainable Development Goal 4 (SDG 4), which aims to ensure inclusive and equitable quality education. Strategies to foster positive learning environments and enhance student motivation should be prioritized. Additionally, further research is recommended to validate these findings and explore other factors influencing student achievement in mathematics.

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Table 4. Mediation Estimates

Effect	Label	Estimate	S.E.	Lower	Upper	C.R.	P-value
Indirect	a × b	0.043	0.046	-0.020	0.160	0.937	0.349
Direct	c’	0.635	0.230	0.168	1.071	2.754	0.006
Total	c’ + a × b	0.678	0.228	0.215	1.110	2.976	0.003

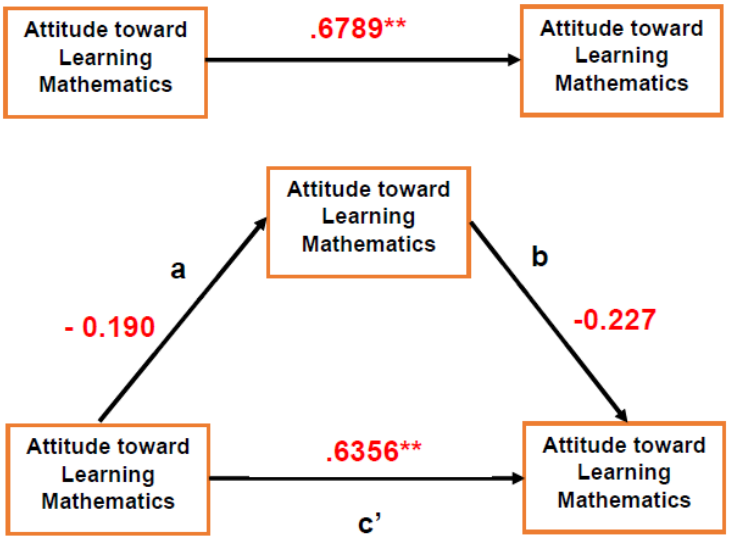

Fig. 1. Mediating Model

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