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The Effect of Collaborative Learning and Teacher Support on Math Self-Efficacy

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ABSTRACT

Mathematics self-efficacy plays a critical role in shaping students' academic performance and long-term engagement with the subject. This study investigates how collaborative learning among peers and support from teachers influence students' beliefs in their mathematical abilities. A descriptive-correlational design was employed involving junior high school students, with data collected through a validated self-report questionnaire. Results indicate that both peer collaboration and teacher support significantly enhance students' math self-efficacy. Because these social factors help students feel encouraged, capable, and supported, they develop stronger confidence in tackling mathematical problems. The findings suggest that educational strategies that foster cooperative learning environments and consistent teacher guidance can positively impact students' attitudes toward mathematics. This study contributes to the understanding of how social contexts influence psychological constructs, providing practical insights for educators seeking to cultivate positive learning environments that support math achievement and resilience.

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1. INTRODUCTION

Confidence in mathematics is a crucial psychological factor that significantly influences students' engagement, persistence, and achievement. As mathematics is often perceived as a difficult subject, students' belief in their capability to perform mathematical tasks (commonly referred to as math self-efficacy) has gained attention among educational researchers. Research shows that self-efficacy is shaped not only by internal traits but also by social influences, including peer interaction and teacher support.

Collaborative learning is one of the classroom strategies proven to support the development of academic self-beliefs. Through peer discussions and cooperative problem-solving, students are more likely to receive encouragement, clarify misconceptions, and learn from others' reasoning processes (Gillies, 2006). Similarly, the presence of emotionally supportive and pedagogically responsive teachers strengthens students' confidence by creating a safe environment for learning and growth (Wentzel, 1998). Teacher support has been associated with greater academic motivation and higher perceived competence in mathematics. In the Philippines, several studies have emphasized the need to address math anxiety and low confidence among learners, particularly at the junior high school level, where conceptual load increases (David *et al*., 2021). Interventions involving peer-assisted learning and teacher mentoring contribute to the enhancement of math performance and self-perception. These findings suggest that peer and teacher relationships serve as a form of scaffolding that can elevate students' belief in their abilities.

Many reports regarding mathematics education (Hashim *et al*., 2021; Solihah *et al*., 2024; Angraini *et al*., 2024; Farokhah *et al*., 2025; Akinoso, 2023; Radiamoda, 2024; Farokhah *et al*., 2024; Husnah *et al*., 2021; Abiodun *et al*., 2025). While much research has been conducted on math achievement, fewer studies have focused specifically on the social context that shapes self-efficacy in mathematics. This paper addresses this gap by examining how collaborative learning and teacher support influence students' confidence in mathematics using a student-centered, context-driven approach. By isolating these two variables, this study seeks to provide actionable insights for designing classroom interventions that empower students to believe in their mathematical abilities.

The purpose of this paper is to investigate the relationship between collaborative learning, teacher support, and students' self-efficacy in mathematics. The novelty lies in isolating peer and teacher influence within a singular model of student belief formation, and the impact is directed toward improving pedagogical approaches that foster resilient and confident math learners.

2. LITERATURE REVIEW

Mathematics self-efficacy is widely regarded as a critical predictor of students' motivation and academic success in mathematics. It refers to an individual's belief in their ability to successfully perform mathematical tasks and solve problems. According to social cognitive theory, self-efficacy influences effort, persistence, and resilience in the face of challenges. In the context of mathematics, students with high self-efficacy tend to engage more deeply and demonstrate greater persistence when faced with difficult tasks.

Collaborative learning, defined as instructional approaches that encourage students to work together in small groups to achieve shared learning goals, has shown positive effects on academic confidence. Students participating in peer discussions are more likely to construct knowledge, correct misconceptions, and learn alternative problem-solving strategies (Gillies, 2006). The social interaction component of collaboration builds students' sense of belonging, which in turn nurtures their academic self-belief. Cooperative learning structures promote

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mutual interdependence and accountability, reinforcing individual commitment to group success. Teacher support is another key environmental factor that fosters self-efficacy. Supportive teachers not only provide academic assistance but also encourage students emotionally and motivate them to reach their full potential. Wentzel (1998) noted that perceived teacher support is associated with increased engagement and a positive classroom climate, both of which are conducive to building student confidence. Teachers who establish caring relationships and maintain high expectations can reduce the intimidation that students often associate with math tasks, making them more likely to persist.

A growing number of empirical studies have explored how both peer and teacher influences interact to shape students' confidence. Research by Ryan and Patrick (2001) found that middle school students who reported high levels of teacher support and positive peer interaction demonstrated significantly higher academic motivation and self-efficacy. Likewise, peer tutoring and teacher scaffolding have been linked to improvements in students' attitudes toward math and their perceived competence.

In the Philippine context, David *et al*. (2021) highlighted that collaborative learning practices in public high schools contribute positively to students' confidence and reduce math anxiety. Furthermore, local studies affirm the importance of integrating social-emotional learning with instructional content, particularly in subjects perceived as difficult, such as mathematics.Despite the known benefits of collaborative and teacher-mediated learning, there remains a gap in understanding how these variables jointly predict math self-efficacy, especially within the junior high school population. This study builds on existing work by isolating these two key factors and examining their independent and combined effects on students' confidence in math.

3. METHODS

This study employed a descriptive-correlational research design to examine the relationship between collaborative learning, teacher support, and students' self-efficacy in mathematics. The method focused on measuring how social learning environments influence students' confidence in math without manipulating any variables.

The participants in this study consisted of junior high school students from Sultan Kudarat State University Laboratory High School. A purposive sampling technique was used to select students who were currently enrolled in mathematics subjects. The final sample size included 120 students across Grade 8 and Grade 9 levels.

A validated questionnaire was the primary instrument for data collection. The instrument included three major parts: (i) items measuring collaborative learning experience; (ii) teacher support perception scale, and (iii) a self-efficacy in mathematics scale.

All items were rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The questionnaire underwent expert validation by mathematics educators and guidance professionals. A pilot test was conducted with a sample of 30 students from a nearby public school to establish reliability. Cronbach's alpha values were found to be above 0.80 for all constructs, indicating high internal consistency.

Data were collected during regular class hours with the cooperation of math teachers. Participation was voluntary, and all ethical considerations were strictly followed, including informed consent and confidentiality of responses.

Descriptive statistics such as mean and standard deviation were used to summarize the data. Pearson correlation analysis was applied to determine the relationships among the variables. To further explore predictive strength, a multiple regression analysis was conducted

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with math self-efficacy as the dependent variable and collaborative learning and teacher support as the predictors.

The findings were interpreted based on both statistical significance ($p < 0.05$) and effect sizes to ensure practical relevance.

4. RESULTS AND DISCUSSION

The data gathered from 120 junior high school students were analyzed to determine the influence of collaborative learning and teacher support on students' self-efficacy in mathematics. Descriptive statistics provided an overview of students' perceptions, while inferential analyses were used to examine relationships among the variables.

4.1. Descriptive Statistics

The mean score for collaborative learning was 4.02 (SD = 0.61), indicating that students generally agreed that peer collaboration occurred regularly and contributed positively to their understanding. Teacher support received a mean of 4.15 (SD = 0.54), reflecting a strong perception of guidance, emotional support, and availability from instructors. Math self-efficacy had a mean of 3.89 (SD = 0.65), suggesting that students moderately believed in their ability to handle math tasks.

4.2. Correlation Analysis

The Pearson correlation coefficients showed that both collaborative learning ($r = 0.58$, $p < 0.01$) and teacher support ($r = 0.64$, $p < 0.01$) had significant positive relationships with students' math self-efficacy. This implies that higher levels of peer engagement and teacher support are associated with greater confidence in mathematics.

4.3. Regression Analysis

A multiple regression analysis was conducted to determine the predictive power of the two independent variables on self-efficacy (**Table 1**). The model was statistically significant, $F(2, 117) = 32.45$, $p < 0.001$, with an R^2 of 0.356. This indicates that 35.6% of the variance in math self-efficacy could be explained by collaborative learning and teacher support.

The beta coefficients indicate that both variables significantly predicted math self-efficacy, with teacher support having a slightly stronger influence than collaborative learning.

These results support the hypothesis that social learning environments contribute meaningfully to students' belief in their mathematical abilities. The findings serve as empirical evidence that both peer collaboration and teacher facilitation play essential roles in shaping students' academic self-concept.

Table 1. Analysis data.

Predictor	B	SE B	β	t	p
Collaborative Learning	0.32	0.08	0.34	4.00	<0.001
Teacher Support	0.41	0.09	0.39	4.56	<0.001

4.4. Discussion

The findings of this study confirm the significant role that collaborative learning and teacher support play in shaping junior high school students' self-efficacy in mathematics. The positive correlations between both variables and students' self-confidence align with existing literature emphasizing the social dimension of academic development (Ryan & Patrick, 2001;

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Gillies, 2006). These results reinforce the applicability of social cognitive theory, which posits that self-efficacy is influenced by environmental and social interactions.

Students who frequently engage in collaborative learning activities are more likely to develop a sense of competence through shared problem-solving, peer validation, and mutual support. As peers challenge one another's ideas and clarify misconceptions, learners are exposed to multiple problem-solving strategies, which not only improve their conceptual understanding but also enhance their confidence. In this study, collaborative learning had a moderately strong and statistically significant effect on math self-efficacy, corroborating previous studies that highlight the cognitive and motivational benefits of cooperative work (David *et al*., 2021).

More notably, teacher support emerged as a stronger predictor of self-efficacy. This affirms the pivotal influence of teacher-student interactions on learners' emotional and academic well-being. Approachable teachers, who provide constructive feedback and encourage students through verbal persuasion, foster a learning environment where students feel valued and capable (Wentzel, 1998). Such an environment mitigates the anxiety and fear often associated with mathematics and encourages greater persistence and effort in tackling complex problems.

The regression results, indicating that both variables account for over a third of the variance in self-efficacy, suggest that educational interventions aiming to improve student confidence in mathematics should integrate strategies that enhance both peer collaboration and teacher facilitation. For instance, implementing structured group activities and promoting a caring, inclusive classroom culture can be effective in boosting students' academic beliefs. The findings also highlight the importance of teacher professional development programs that emphasize not only subject expertise but also relational competencies and student engagement strategies. Similarly, curricula should be designed to embed collaborative learning structures within math instruction to encourage social interaction and active participation. Despite the positive results, it is worth noting that other unexamined variables—such as parental involvement, prior achievement, or classroom climate—may also contribute to students' self-efficacy and should be considered in future research. Nonetheless, this study provides compelling evidence for educators and school administrators to prioritize social and emotional supports alongside academic content in mathematics education.

5. CONCLUSION

This study investigated the effects of collaborative learning and teacher support on junior high school students' self-efficacy in mathematics. The findings demonstrated that both factors significantly and positively influenced students' confidence in their mathematical abilities. Teacher support emerged as the stronger predictor, emphasizing the critical role of educators in shaping students' academic self-belief. Likewise, peer collaboration facilitated active learning and reinforced students' engagement and motivation.

These results underscore the importance of creating supportive and interactive learning environments in mathematics classrooms. Educators are encouraged to foster collaborative learning opportunities and build trusting, respectful relationships with students to enhance their confidence and persistence in solving mathematical problems.

Future research should explore additional contextual and individual factors influencing math self-efficacy and assess long-term outcomes. Integrating teacher training on emotional support and instructional design that embeds cooperative learning strategies may offer sustainable improvements in students' academic development.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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