© IJARW | ISSN (O) - 2582-1008
April 2026 | Vol. 7 Issue. 10
www.ijarw.com

Exploring Student Perceptions and Engagement in Collaborative Math Learning

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ABSTRACT

This study explored the connection between students' perceptions of collaborative learning and their engagement in mathematics among 45 Junior High School students at Old Nongnongan National High School during the 2024–2025 school year. Using a descriptive-correlational design and simple random sampling, data were gathered through a checklist for collaborative learning and a 5-point Likert scale to measure engagement across cognitive, behavioral, emotional, and social dimensions. Findings revealed that students perceived the effects of collaborative learning to be moderate and demonstrated a moderate level of engagement in mathematics; however, no statistically significant relationship was found between the two variables. This indicates that students' perceptions of collaborative learning do not necessarily correspond to their level of engagement in mathematics. Based on these results, it is recommended that teachers carefully examine the quality and structure of collaborative learning activities and consider additional factors that may influence student engagement. Future studies may further investigate other variables, such as motivation, self-efficacy, and classroom climate, to better understand what contributes to students' engagement in mathematics.

Keyword: Perceptions, Collaborative Learning, Engagement, Descriptive-Correlational, Relationship

1. INTRODUCTION

Collaborative learning has become an increasingly prominent approach in contemporary classrooms. Collaboration involves students working together in small groups to solve problems, exchange ideas, and accomplish shared learning goals. Mok and Cheng (2022) note that collaborative learning promotes active participation in the classroom. Grounded in Vygotsky's (1978) social constructivist theory, which emphasizes learning through social interaction and cooperation, this approach highlights the importance of peer engagement in knowledge construction. In this study, the focus is not on determining the effectiveness of collaborative learning through experimentation, but rather on describing students' perceptions of collaborative learning and examining how these perceptions are associated with their academic and social development. Understanding these perceptions may provide valuable insights into how collaborative learning is experienced in the classroom context.

Student engagement is widely recognized as a key factor influencing academic success, similar to the role of collaboration in learning. Engagement refers to the degree to which students are interested, curious, and actively involved in their own learning process. Fredricks et al. (2004) identified three dimensions of student engagement: behavioral engagement (students' participation in academic activities), emotional engagement (students' feelings toward school and learning), and cognitive engagement (students' investment in understanding complex ideas). Later, Fredricks et al. (2019) expanded this framework by including social engagement, which refers to how students build relationships and interact with peers and teachers. Social engagement is particularly relevant in collaborative learning contexts, where interaction and shared understanding are central (Freda et al., 2023).

Although collaborative learning is commonly viewed as a beneficial instructional approach, maintaining high levels of engagement—particularly in mathematics—remains a challenge.

In the Philippines, many students continue to struggle with mathematics performance and motivation. Reports from the Department of Education (DepEd) on the National Achievement Test (NAT) indicate that students' performance in Mathematics often falls below expected proficiency levels. Similarly, results from the 2018 Programme for International Student Assessment (PISA) conducted by the OECD (2019) showed that the Philippines ranked near the bottom in mathematics, reading, and science. These findings highlight persistent concerns about students' engagement and achievement in mathematics both nationally and globally.

In response, national policies such as Republic Act No. 10533, also known as the Enhanced Basic Education Act of 2013 (K to 12 Law), promote learner-centered approaches that encourage active participation. Recent reforms such as the MATATAG Curriculum and the Basic Education Development Plan 2030 likewise emphasize teaching strategies that foster engagement and develop 21st-century skills. At the global level, the United Nations Sustainable Development Goal (SDG) 4 advocates for inclusive and equitable quality education that supports lifelong learning, including skills such as teamwork, communication, and critical thinking (UNESCO, 2020). These frameworks recognize the importance of instructional approaches like collaborative learning in enhancing students' learning experiences.

While numerous studies suggest that collaborative learning can support academic and social development (Johnson & Johnson, 2009), students' experiences and perceptions of group work vary. Some students describe collaborative learning as supportive and motivating, particularly when participation, roles, and communication are balanced. Others describe it as frustrating when tasks are unequally distributed or poorly organized. Students' perceptions of collaborative learning may be associated with how engaged they feel during group activities, especially in demanding subjects such as mathematics. More positive perceptions may be linked with higher levels of motivation and participation, whereas less favorable perceptions may correspond with lower levels of interest or involvement.

Given these considerations, this study does not aim to test the effectiveness of collaborative learning. Rather, it seeks to examine students' perceptions of collaborative learning and how these perceptions are related to their academic engagement in mathematics. By describing how students view collaborative learning experiences and analyzing how these perceptions are associated with behavioral, emotional, cognitive, and social engagement, educators may gain insights into how collaborative activities are experienced in mathematics classrooms.

The findings of this study may contribute to improving classroom practices by providing evidence on how students perceive collaborative learning in relation to their engagement. Such insights may support schools in aligning instructional practices with national policies and global educational goals while addressing ongoing concerns about student engagement in mathematics.

2. OBJECTIVES OF THE STUDY

The main objective of this study is to examine the relationship between students' perceptions of collaborative learning and their engagement in math among Grade 7 classes of Old Nongnongan National High School enrolled during the S.Y. 2024- 2025. Specifically, this study aimed to:

1. describe students' perceptions of collaborative learning in mathematics;

2. determine the level of students' engagement in mathematics based on behavioral, emotional, cognitive, and social dimensions; and

3. examine the relationship between students' perceptions of collaborative learning and their engagement in mathematics.**3.**

3.METHODOLOGY

This chapter outlines the research methodology employed in the study. It includes a detailed discussion of the research design, locale of the study, respondents, sampling procedure, research instruments, data collection process, ethical considerations, and data analysis techniques utilized in the investigation.

3.1. Research Design

This study employed a descriptive-correlational quantitative research design to examine the relationship between students' perceptions of collaborative learning and their engagement in math. A descriptive design aimed to present an accurate picture of students' views and behavior without altering any conditions. The correlation aspect examined whether a connection exists between how students perceive collaborative learning and their engagement in math activities, without suggesting one causes the other.

As a quantitative study, it gathers numerical data and uses statistical methods to analyze the results. This design helps the researcher describe and measure the link between collaborative learning and student engagement in math.

3.2. Locale of the Study

This study was conducted at Old Nongnongan National High School, located in Old Nongnongan, Don Carlos, Bukidnon, in Northern Mindanao, Philippines. The school is near important landmarks like the Barangay Health Clinic, Roman Catholic Church and Barangay Hall. It has a rich history spanning over five decades. In 2019, the school celebrated its 49th Foundation Day from February 13-15, marking 49 years of educational service to the community. Today, it is a fully functioning high school with 33 teachers and staff and 530 students, including those in Senior High School.

This school was chosen for the study because of its different social and economic conditions and the varied backgrounds of its students. The physical environment consists of modern classrooms, laboratories and a library creating a conducive learning atmosphere. The school emphasizes an inclusive curriculum that caters to students with varying needs, making it an ideal setting for exploring educational interventions.

3.3. Respondents and Sampling

The respondents involved are 45 Junior High School (JHS) students from G7 curriculum of Old Nongnongan National High School enrolled during the S.Y. 2024- 2025. This is one of the secondary schools within Don Carlos District III, Old Nongnongan, Don Carlos Bukidnon, Philippines. The choice of this setting is justified by its reputation for academic excellence and its commitment to student well-being, which aligns with the study's aim to examine the relationship between students' perceptions of collaborative learning and their engagement in math. This research utilized simple random sampling techniques to select respondents. This means that each member of the population has an equal and independent chance of being chosen. This method was used to ensure objectivity and to minimize selection bias in gathering data related to student perceptions of collaborative learning and their engagement in math.

Each student was assigned a number, and a random number generator was used to identify the participants. This approach allowed for a fair representation of the population, ensuring that the findings on students' perceptions of collaborative learning and students' engagement in math could be generalized more confidently within the Grade 7 level.

3.4. Research Instrument

A structured questionnaire was used, consisting of two sections, the Students' Perceptions Scale of Collaborative Learning in Math (SPSCLM) adapted from Abd Algani 2021 and the Math Engagement Scale (MES) developed by Fredricks and Wang et.al 2016. The questionnaire was pilot tested with G8 Junior High School Students at Old Nongnongan National High School and yielded a Cronbach's Alpha of 0.857 and 0.829, respectively.

The Students' Perceptions Scale of Collaborative Learning in Math (SPSCLM) adapted from Abd Algani 2021, a four-point Likert scale (ranging from Strongly Disagree to Strongly Agree) used to measure and evaluate how students perceive collaborative learning in an educational setting. This type of instrument helps gather data on students' attitudes, experiences, and opinions about collaborative learning activities and their impact on students' engagement. The interpretation of SPSCLM scale is as follows:

Scale	Range	Descriptive Rating	Qualitative Interpretation
4	3.26-4.00	Strongly Agree	High Perception
3	2.51-3.25	Agree	Moderate Perception
2	1.76-2.50	Disagree	Low Perception
1	1.00-1.75	Strongly Disagree	Very Low Perception

Meanwhile, students' engagement is measured using the Math Engagement Scale (MES), a five-point Likert scale adapted from Fredricks and Wang et al. 2016. This was used to assess students' behavioral, emotional, social and cognitive engagement. Behavioral engagement (8 items) captured student compliance, classroom participation, and involvement in learning; emotional engagement (10 items) included emotional experiences, interest, and task value; cognitive engagement (8 items) measured self-regulated learning, use of meta-cognitive strategies, and psychological investment and the social engagement (7 items) measures how students interact with peers and teachers to support learning. All 33 items of the Math Engagement Scale were scored on a 5-point Likert scale with responses from (1) Strongly Disagree to (5) Strongly Agree. The interpretation of the questionnaire is outlined below:

Scale	Range	Description	Interpretation
5	4.21–5.00	Strongly agree	Very high
4	3.41–4.20	Agree	High
3	2.61–3.40	Neutral	Moderate
2	1.81–2.60	Disagree	Low
1	1.00–1.80	Strongly disagree	Very low

3.5. Data Gathering Procedure

Before the implementation of the study, the researcher obtained permission from the School Principal of Old Nongnongan National High School. The letter was approved by the Subject Instructor at Central Mindanao University.

After the list of participants had been finalized, the researcher distributed the informed consent letters to the selected participants. They were informed that participation in the study was entirely voluntary and that they had the right to decline without any consequences. Their privacy was protected, and their responses were kept confidential and used solely for research purposes. The results were presented in aggregated form to ensure that no individual student could be identified. Furthermore, students were given the right to skip any questions they felt uncomfortable answering.

3.6. Statistical Analysis

The gathered data was carefully analyzed using appropriate statistical tools to ensure accurate and meaningful insights. Descriptive statistics, such as mean and standard deviation was used to evaluate the level of students' perceptions of collaborative learning and their engagement in math.

To analyze the relationships between these variables, inferential statistics was utilized. In particular, the Pearson Correlation was used to assess whether there is a significant relationship between students' perceptions of collaborative learning and their engagement in math.

4. RESULTS AND DISCUSSIONS

These are the results obtained from the respondent data, presented, interpreted, discussed based on the order of the statement of the problem.

4.1. Students' Perceptions of Collaborative Learning in Math

The students' perceptions of collaborative learning in math were measured using the Students' Perception Scale of Collaborative Learning in Math (SPSCLM) to evaluate how students perceive collaborative learning in an educational setting. The result is presented in Table 1 reveals that students had moderate perceptions of collaborative learning in math, with an overall mean of 3.03. This suggests that students recognize the value of collaborative activities, such as peer interaction and group problem-solving, but their appreciation or preference for such learning strategies may still be developing. Factors such as group dynamics, individual learning styles, or lack of training in collaboration could influence these perceptions.

Table 1. *Students' Perceptions of Collaborative Learning in Math*

Indicators	Mean	SD	QD
Collaborative learning helps me improve our ability to move ideas from one concept to another.	3.40	0.72	SA
Via competitive activities, collaborative learning helps me to learn arithmetic.	3.22	0.60	A
Collaborative learning encourages me to come up with new ways to solve the same math problem.	3.20	0.63	A
…	…	…	…
Collaborative learning encourages me to speak about whatever I want	2.58	0.62	A

without being constrained by a particular subject.			
Collaborative learning increases my interest in subjects outside of the classroom.	2.58	0.81	A
Math challenges are eliminated by collaborative learning.	2.53	0.81	A
Overall	3.03		A

Table 1 presents the students' perceptions of collaborative learning in mathematics using a 4-point Likert scale. It shows the mean, standard deviation (SD), descriptive rating, and qualitative interpretation for each indicator. The highest mean score (M=3.40, SD=0.72) indicates a high perception of collaborative learning helping students move ideas from one concept to another. The lowest mean scores (M=2.53–2.58) reflect moderate perceptions, particularly in areas involving broader real-life application and subject-free expression. The overall mean perception is 3.03, interpreted as moderate. Most indicators fell within the "moderate perception" range (mean scores between 2.91 and 3.22), suggesting that while students generally acknowledge the benefits of collaborative learning in math, there is room for improvement. High agreement was centered on cognitive benefits, such as concept transfer and arithmetic learning through competition. Lower ratings were associated with collaborative learning's impact on broader thinking, real-life application, and interdisciplinary engagement.

The findings align with Vygotsky's Social Constructivist Theory, which posits that learning is socially mediated and enhanced through interaction. Students showed stronger agreement with items reflecting Vygotsky's 'Zone of Proximal Development' — such as using peer collaboration to improve aptitude and problem-solving. However, lower scores on indicators like 'encouragement to speak without subject constraints' suggest that some students still perceive collaborative learning as structured and topic-bound, limiting creative and cross-subject engagement.

The table shows that students think collaborative learning (working together with others) helps them in many ways, like solving problems and sharing ideas. But their feelings are only "moderate", meaning they see some benefits but still have doubts. Othman, Wong, and Mohamed (2020) found that students perceived collaborative learning as beneficial for sharing knowledge and boosting confidence, but challenges like group imbalance sometimes limited its effectiveness. Students think teamwork helps them understand math better. In line with this, Li and Lin (2017) stated that collaborative learning improves problem-solving skills and mathematical reasoning when properly structured. Students feel more confident solving math problems with others. Gillies and Boyle (2020) supported that structured peer interactions boost students' confidence and encourage risk-taking in problem-solving. Teamwork helps students share ideas and learn new ways to solve problems. Tran (2019) emphasized that peer learning exposes students to diverse strategies, enhancing critical thinking.

Students believe collaborative learning makes math more fun and creative. Similarly, Laal and Laal (2018) noted that students find collaborative tasks more engaging and motivating compared to individual tasks. Students still feel shy or unsure when expressing their own ideas. Järvelä et al. (2016) highlighted that social anxiety can limit participation in group activities unless the environment is supportive. Collaborative learning helps students get more involved in math class. Borrego, Cutler, Prince, Henderson, and Froyd (2018) found that active and collaborative learning strategies increase students' academic engagement and sense of belonging. Some students are not yet fully sure if teamwork helps them learn better. Davidson and Major (2014) (though slightly earlier) and Tomas et al. (2020) confirmed that while cooperative learning offers benefits, its success depends heavily on how group roles and goals are structured. Students like solving problems with peers, but they still want to learn more about how to do it effectively.

Gillies (2016) asserted that explicit instruction in group work skills significantly improves students' collaborative experiences. Group activities help students connect math to real life, but not all students see this yet. Boaler and Staples (2016) emphasized that project-based and real-world collaborative math tasks increase student interest and understanding, but only when they see the relevance clearly. Some students feel that collaborative learning still needs improvement to be more helpful. OECD (2017) in their study on collaborative problem-solving skills stressed that

careful teacher facilitation is essential to ensure all students are actively learning during group work.

The moderate overall perception suggests that collaborative learning is somewhat effective in math education but may lack full integration of higher-order thinking and real-world application. Educators might consider enhancing collaborative strategies to promote critical thinking, interdisciplinary learning, and real-life context (as advocated by Bruner's Discovery Learning Theory). This shift can help transform passive group work into purposeful, student-driven inquiry that strengthens both math skills and broader competencies.

4.2. Students' Engagement in Math

The students' engagement in math was measured using the Math Engagement Scale (MES) of Fredricks and Wang et. al. (2016) which focuses on the four dimensions of students' engagement; cognitive, behavioral, emotional and social dimensions. The result was found by getting the mean from each of these areas based on the answers from the respondents.

Table 2. *Students' Engagement in Math based on Cognitive Dimension*

Indicators	Mean	SD	QD
I try to understand my mistakes when I get something wrong.	4.22	0.77	SA
I try to connect what I am learning to things I have learned before.	4.16	0.74	A
I go through the work that I do for math class and make sure that it's right.	4.13	0.79	A
I think about different ways to solve a problem.	4.11	0.88	A
I did just enough to get by in class.	3.69	0.85	A
I don't think that it is hard to do work for class.	3.47	0.92	A
I only study the easy parts when work is hard.	3.13	0.89	N
I would rather be told the answer than do the work.	2.69	1.16	N
Overall	3.70		A

This table presents the cognitive engagement of students using indicators that reflect how they approach and process learning tasks. Each indicator is rated with a mean score and qualitative interpretation. The indicator with the highest mean score is "I try to understand my mistakes when I get something wrong" (M = 4.22, SD = 0.77), interpreted as Very High Engagement. This is followed by indicators such as "I try to connect what I am learning to things I have learned before" (M = 4.16) and "I go through the work that I do for math class and make sure that it's right" (M = 4.13), both showing High Engagement. Indicators with the lowest means include "I only study the easy parts when work is hard" (M = 3.13) and "I would rather be told the answer than do the work" (M = 2.69), both reflecting Moderate Engagement. The overall mean is 3.70, which indicates an overall High Engagement in terms of cognitive aspects.

The results reveal that students show strong cognitive engagement, particularly in areas involving reflection, connection to prior knowledge, and accuracy in task completion. The highest-rated indicator, "I try to understand my mistakes when I get something wrong" (M = 4.22), suggests that students are actively monitoring their learning, a key element of metacognition. This aligns with Flavell's Metacognitive Theory, which emphasizes learners' ability to regulate their cognitive processes for better academic outcomes. Similarly, high scores in "I try to connect what I am learning to things I have learned before" and "I go through the work that I do for math class and make sure that it's right" indicate that students are applying deep learning strategies. These behaviors suggest that learners are not just memorizing content but are engaging in meaningful learning by constructing new knowledge based on what they already know.

The statement with very high cognitive engagement shows that students who reflect on and analyze their mistakes are using metacognitive skills. This means they are thinking carefully about their own learning, noticing when they make errors, and trying to fix them. Panadero (2017) explained that metacognition, or "thinking about your thinking," helps students manage their learning better and leads to improved academic results. When students monitor and control how they learn, they become more independent and successful. The statement "I try to understand my mistakes when I get something wrong" shows a growth mindset, where students believe they can improve through effort and learning from mistakes. Yeager and Dweck (2019) supported that students with a growth mindset are more likely to face challenges bravely and keep trying even when they struggle. Instead of feeling bad

about mistakes, they use mistakes as a chance to get better.

Similarly, Bernacki, Greene, and Crompton (2020) found that students who practice self-regulated learning — setting goals, reflecting on their progress, and adjusting their strategies — show higher motivation and academic achievement. When students reflect on their mistakes, they are not just memorizing; they are developing deeper thinking skills that help them solve harder problems later on. Bannert and Reimann (2017) also showed that guiding students to reflect on errors improves their problem-solving abilities because they learn to think more flexibly and carefully. Finally, students who engage deeply with their learning, like analyzing mistakes, often show greater persistence — they don't give up easily. Veenman (2018) emphasized that cognitive engagement through self-reflection makes students more willing to put in extra effort to succeed.

The indicator with high engagement implies deep learning and understanding. By connecting new knowledge to prior knowledge, students engage in elaborative rehearsal, a strategy that leads to better retention and deeper understanding. The ability to make connections between what is learned now, and past learning improves the likelihood that knowledge will transfer to different situations, which is essential for mastery in mathematics. Making connections between ideas is a key element of critical thinking, which encourages students to think analytically about the material and apply it in different contexts. Piaget's theory emphasizes how new knowledge is assimilated into existing cognitive structures, supporting the importance of making connections. The statement "I try to connect what I am learning to things I have learned before" implies that students are utilizing constructivist learning principles, where they build new knowledge upon existing knowledge structures. This enhances their ability to transfer learning to new contexts.

However, moderate engagement in statements like "I would rather be told the answer than do the work" (M = 2.69) and "I only study the easy parts when work is hard" (M = 3.13) signals the presence of surface learning approaches in some students. This means they might not feel confident enough, motivated enough, or skilled enough to work through difficult problems. A study from South Australia (Jones, 2023) showed that teaching students self-regulation skills — like managing emotions and staying calm when frustrated — led to better behavior and academic success. This proves that training students to manage their learning and emotions can help them engage more deeply. Research by Garcia, Manguiat, and Austria (2021) in the Philippines found that students with a growth mindset — believing they can get better through effort — had stronger career goals and better motivation to keep learning. Another study by Zhu, Chen, Chen, and Chern (2016) in China discovered that students who believe they can improve are more engaged in school and feel happier and more successful. These findings suggest that helping students build self-regulation, academic resilience, and a growth mindset can move them away from surface learning and toward deeper, more meaningful learning. When students learn to face challenges instead of avoiding them, they develop better thinking skills, stronger learning habits, and more confidence in their abilities.

Table 3. *Students' Engagement in Math based on Behavioral Dimension*

Indicators	Mean	SD	QD
I stay focused.	4.49	0.73	SA
I put effort into learning math.	4.33	0.71	SA
I completed my homework on time.	4.07	0.86	A
I keep trying even if something is hard.	4.00	0.80	A
I talk about math outside of class.	3.24	1.00	N
I do other things when I am supposed to be paying attention.	2.42	1.08	D
If I don't understand I give up right away.	1.89	1.19	D
I don't participate in math class.	1.56	0.92	SD
Overall	3.25		N

This table presents students' behavioral engagement in mathematics through indicators such as focus, participation, effort, and persistence. Each item is rated with a mean score and interpreted qualitatively. The highest-rated indicators are "I stay focused" (M = 4.49, SD = 0.73) and "I put effort into learning math" (M = 4.33, SD = 0.71), both interpreted as Very High Engagement. This indicates strong positive behaviors related to concentration and motivation in math learning. Other high-engagement behaviors include completing homework on time (M = 4.07) and persistence when tasks are difficult

(M = 4.00). However, lower engagement is observed in items like "I do other things when I am supposed to be paying attention" (M = 2.42), "If I don't understand I give up right away" (M = 1.89), and "I don't participate in math class" (M = 1.56), the last of which is rated as Very Low Engagement. The overall mean is 3.25, reflecting Moderate Engagement in behavioral aspects.

The data shows that students generally exhibit positive behavioral engagement when it comes to focusing, putting in effort, and staying persistent in math. When students say, "I put effort into learning math," it shows they are really trying to master the subject. This kind of effort means they are focused, motivated, and willing to work hard even when things are tough. Recent studies support this idea. For example, Tang et al. (2020) found that students who put in effort and stay focused do much better in school and are more motivated to learn. Another study by Nouri et al. (2020) showed that when students use active learning strategies, like summarizing and self-testing, they understand the material better and remember it longer. Research by Hagger and Hamilton (2019) also explained that students who believe their hard work can make them smarter (a growth mindset) have stronger motivation and don't give up easily. Putting effort into learning also builds self-efficacy, which means students believe they can succeed if they keep working hard (Zhen et al., 2017). Students who are self-motivated and self-regulated usually become better at solving problems and keeping their knowledge over time. Overall, trying hard, even in hard subjects like math, leads to better learning, higher confidence, and success in school.

The statement "I don't participate in math class" reflects very low behavioral engagement. This implies lack of active learning; decreased academic achievement; isolation from classroom community; negative impact on motivation; and inability to develop collaborative skills. The statement "If I don't understand I give up right away" also shows very low engagement. This implies lack of perseverance and resilience; failure to develop problem solving skills; lower self-efficacy; negative impact on long-term learning; and academic disengagement. When students easily give up or don't join class activities, it often leads to poor grades, low motivation, and feeling left out. Recent studies show the same thing. For example, Quin (2017) found that students who don't stay engaged in class usually perform worse and feel less connected to school. Dweck's (2017) updated research says that students who quit when things get hard often have a fixed mindset — meaning they believe they can't improve, so they don't even try. Another study by Wang et al. (2019) showed that when students don't take part actively, their motivation drops, and their grades suffer. Bandura's ideas are still supported by new research, like that of Honicke and Broadbent (2016), who found that students with low self-efficacy (low belief in their ability) are more likely to give up when learning gets tough. Finally, Collie et al. (2017) highlighted that students who are academically resilient — those who keep trying even after failing — do much better in school. Students who give up quickly often don't develop the resilience they need to bounce back from challenges.

Table 4. *Students' Engagement in Math based on Emotional Dimension*

Indicators	Mean	SD	QD
I want to understand what is learned in math class.	4.49	0.82	SA
I enjoy learning new things about math.	4.33	0.98	SA
I feel good when I am in math class.	3.93	0.91	A
I look forward to math class.	3.82	1.07	A
I often feel down when I am in math class.	2.47	0.99	N
I get worried when learning new things about math.	2.38	0.89	D
I often feel frustrated in math class.	2.31	1.00	D
I think that math class is boring.	2.00	1.07	D
I don't want to be in math class.	1.87	0.99	D
I don't care about learning math.	1.64	1.00	SD
Overall	2.92		N

This table presents the emotional responses of students toward mathematics. It includes indicators related to their interest, enjoyment, anxiety, and attitudes, with each item scored by mean and qualitatively interpreted. The highest-rated indicators are "I want to understand what is learned in math class" (M = 4.49, SD = 0.82) and "I enjoy learning new things about math" (M = 4.33, SD = 0.98), both reflecting Very High Engagement. This suggests that students exhibit strong intrinsic motivation and interest in

mathematics. On the other hand, indicators like "I don't care about learning math" (M = 1.64), "I don't want to be in math class" (M = 1.87), and "I think that math class is boring" (M = 2.00) reveal Low to Very Low Engagement. These suggest negative emotional reactions or disinterest among some students. The overall mean is 2.92, interpreted as Moderate Engagement in the emotional dimension.

The emotional data implies that many students want to understand math (Mean = 4.49) and enjoy learning new things (Mean = 4.33), because of this teacher can make lessons even more interesting and fun to keep their curiosity strong. Boaler (2016) showed that when students see how math connects to everyday life, they care more about learning and stay interested. Students feel good in math class (Mean = 3.93), so teachers can plan activities that make students feel proud, happy, and excited when solving problems. Pekrun et al. (2017) found that students who enjoy learning and feel positive emotions in class perform better academically.

The data shows that there are students who still feel worried (Mean = 2.38) and frustrated (Mean = 2.31) in math, teachers may teach strategies like "growth mindset" and remind them that mistakes are part of learning. Yeager et al. (2019) showed that teaching a growth mindset helps students worry less about tough subjects like math. Linnenbrink-Garcia and Pekrun (2016) explained that students need help in managing emotions like frustration to stay motivated. With some students thinking math is boring (Mean = 2.00), teachers may use real-life examples, games, and challenges to show how math is useful and exciting. Fredricks et al. (2016) found that when lessons are fun and connect to real life, students feel more excited and involved. A few students show very low care for math (Mean = 1.64). Teachers and parents should help students see how important math is for their dreams and future jobs.

Table 5. *Students' Engagement in Math based on Social Dimension*

Indicators	Mean	SD	QD
I try to understand other people's ideas in math class.	4.11	0.78	A
I try to help others who are struggling in math.	4.11	0.71	A
I try to work with others who can help me in math.	4.04	0.82	A
I build on others' ideas.	3.44	1.16	A
I don't share ideas when working with others.	2.04	1.15	D
I don't care about other people's ideas.	2.02	1.25	D
I don't like working with classmates.	1.98	1.27	D
Overall	3.11		N

Table 5 presents data on students' engagement in mathematics based on the social dimension. It includes seven indicators measuring various social behaviors and interactions in a classroom setting. Each indicator is rated with a mean score, standard deviation (SD), and a qualitative interpretation. The overall mean of all indicators is also provided to reflect the general level of social engagement.

The data reveals that students scored highest on the indicators "I try to understand other people's ideas in math class" and "I try to help others who are struggling in math," both with a mean of 4.11, indicating high engagement. Similarly, the item "I try to work with others who can help me in math" also scored high (M = 4.04). These three indicators show strong prosocial academic behaviors. On the other hand, the indicators "I don't share ideas when working with others" (M = 2.04), "I don't care about other people's ideas" (M = 2.02), and "I don't like working with classmates" (M = 1.98) all show low engagement, indicating less agreement with antisocial or disengaged behaviors. The indicator "I build on others' ideas" received a moderate-to-high mean score (M = 3.44), suggesting this behavior is somewhat common but not as strongly endorsed. The overall mean of 3.11 suggests a moderate level of social engagement in the academic setting.

The findings imply that students generally exhibit a cooperative and socially supportive environment in math class. High engagement in helping and understanding others aligns with Vygotsky's Sociocultural Theory, which emphasizes the importance of social interaction in cognitive development. According to Vygotsky (1978), learning is fundamentally a social process, and collaborative learning enables students to perform tasks they might not manage alone (Zone of Proximal Development). Since students like helping and understanding others' ideas, teachers can do more group activities and teamwork in math lessons. Gillies (2016) found that when

students work in groups, they understand lessons better and feel more excited to learn. Other students want to help classmates who are struggling, teachers can set up buddy systems where students tutor or mentor each other.

Webb et al. (2017) said that when students share and build on others' ideas, they get better grades in math. Some students don't share ideas because they might feel shy or unsure, hence, teachers should create a classroom where all ideas are respected, and mistakes are seen as part of learning. Wentzel et al. (2016) found that students are more willing to share ideas when teachers and classmates are supportive and kind. Since students are starting to build on others' ideas (Mean = 3.44), teachers can make activities where students solve problems together step-by-step. Topping (2017) explained that when students tutor each other, especially in math, the tutor and the learner both improve their skills. There are students showing negative attitudes towards group work. The data shows that some students (Mean = 1.98–2.04) don't like or care about others' ideas. Teachers must give lessons about teamwork, respect, and why working together helps everyone succeed. Järvelä et al. (2016) found that students work better together when they learn how to respectfully discuss and disagree in groups.

Table 6. Summary Table of *Students' Engagement in Math*

Indicators	Mean	SD	QD
I stay focused.	4.49	0.73	SA
I want to understand what is learned in math class.	4.49	0.82	SA
I put effort into learning math.	4.33	0.71	SA
I enjoy learning new things about math.	4.33	0.98	SA
…	…	…	…
If I don't understand I give up right away.	1.89	1.19	D
I don't want to be in math class.	1.87	1.00	D
I don't care about learning math.	1.64	1.00	SD
I don't participate in math class.	1.56	0.92	SD
Overall	3.23		N

Table 6 presents the students' engagement in mathematics across 33 items, each rated for mean, standard deviation (SD), and qualitative interpretation. The overall mean is 3.23, which indicates a level of Moderate Engagement. Each indicator reflects a different dimension of engagement; social, behavioral, emotional and cognitive dimension. The scores range from a high of 4.49 to a low of 1.56.

The top four highest-rated indicators are: "I stay focused" (M = 4.49, SD = 0.73), "I want to understand what is learned in math class" (M = 4.49, SD = 0.82), "I put effort into learning math" (M = 4.33, SD = 0.71) and "I enjoy learning new things about math" (M = 4.33, SD = 0.98). All these falls under Very High Engagement, highlighting strong self-motivation and a positive attitude toward mathematical learning. In contrast, the two lowest-rated indicators are: "I don't participate in math class" (M = 1.56, SD = 0.92) and "I don't care about learning math" (M = 1.64, SD = 1.00). These reflect Very Low to Low Engagement, suggesting disengagement, negative emotions, or lack of collaborative behavior in a subset of students.

The table shows that most students are somewhat active in math class. Many students show strong effort, but some feel bored, tired, or unmotivated, especially during group tasks or when the lessons are hard. The average score tells us that students are moderately engaged overall. Many students want to understand the lessons and stay focused. Since most students try to stay focused (Mean = 4.49) and put effort into learning math (Mean = 4.33), teachers may keep giving praise and encouragement for hard work and determination. Dweck (2015) explained that students who believe they can grow smarter by working hard do better even when math is difficult. Chi and Wylie (2017) showed that when students actively participate, like asking questions and sharing ideas, they learn deeper and faster. Students try to understand their mistakes (Mean = 4.22), so teachers can give feedback that shows students how mistakes are chances to grow, not reasons to feel bad. Hattie and Timperley (2017) stressed that giving clear feedback about what students did right and what needs improvement boosts academic engagement.

The data indicates that some students give up quickly when they don't understand (Mean = 1.80), teachers should teach strategies like "try again," "ask for help," and "take small steps" when facing tough math problems. Because building on others' ideas (Mean = 3.24) and sharing ideas (Mean = 2.04) are not very strong yet, students

need more fun group activities and teamwork projects to practice working together. Van Leeuwen and Janssen (2019) found that students enjoy math more and stay engaged when they work together in groups. Since some students don't participate (Mean = 1.56) or don't care about math (Mean = 1.64), teachers need to connect math lessons to real-life situations that interest students. Walkington (2015) said that when students see how math connects to their own lives and interests, their motivation and engagement go up.

The results suggest that students are individually driven and cognitively engaged but may lack consistent emotional support and collaborative opportunities in the math classroom. This indicates a need for educators to go beyond promoting academic rigor alone. Fostering collaborative learning environments to improve social interaction and peer support in math learning; integrating emotional and motivational strategies, such as growth mindset reinforcement and reflection activities, to reduce negative feelings and avoidance behaviors; implementing active learning techniques such as math games, group problem-solving, and peer tutoring to increase classroom participation and enjoyment; and targeting interventions for students displaying very low engagement to prevent long-term disconnection from mathematics are some of the instructional strategies and pedagogical approaches in the teaching and learning process. Enhancing student engagement requires a holistic approach that addresses not only what students do, but also how they feel and how they connect with others in the learning process.

4.3. Relationship Between Students' Perceptions of Collaborative Learning and Their Engagement in Math

Table 7. *Correlation Between Students' Perceptions of Collaborative Learning and their Engagement in Math*

Variables	r	p-value
Perceptions of Collaborative Learning in Math Students' Engagement in Math	-0.064	0.677
Overall	3.23	

Table 7 presents the result of a simple correlation analysis conducted to examine the relationship between students' perceptions of collaborative learning in math and their academic engagement in math. The table includes the correlation coefficient (r-value) and the p-value, which indicates the statistical significance of the correlation. The correlation coefficient (r = -0.064) suggests a very weak negative relationship between students' perceptions of collaborative learning and their engagement in math. The p-value of 0.677 indicates that this relationship is not statistically significant at the 0.05 level of significance. Therefore, there is no evidence to suggest a meaningful linear relationship between the two variables in this context.

Although collaborative learning is often associated with enhanced academic engagement, the findings here show no significant correlation between students' perceptions of collaborative learning and their engagement in math. This result may suggest that students' subjective perceptions of collaboration do not necessarily translate into observable academic behaviors or attitudes. According to Bandura's Social Cognitive Theory, self-efficacy and personal agency influence how students respond to collaborative settings. If students perceive collaborative learning as ineffective or poorly structured, it may not positively impact their engagement. The insignificant result could also reflect inconsistencies in the implementation of collaborative strategies in classrooms. For instance, group activities may be present but not truly cooperative in nature, or students may not feel ownership over the learning process. Thus, it is crucial to ensure that collaborative learning is intentionally structured to foster both academic and social development.

Sometimes, students can like working with classmates, but it doesn't really make them more active or focused in Math. Gillies (2016) says group work only helps when students know how to work together well. The way group activities are done in class might not really help students learn or get involved. A study of O'Neill (2016) with university students showed that working in groups helped them understand math topics more deeply. They improved their problem-solving and critical thinking skills by discussing and solving problems together. Research of Shouib and Aslam (2024) with third-grade students found that those who worked in groups scored higher on math tests than before. Group work helped them learn better and perform well. A study by Patricio

(2023) in a Philippine university showed that using team-based learning strategies made students have a better attitude toward math. They felt more positive and engaged.

A study of Wayesa (2020) found that students improved their math discussion skills when they were taught how to work together effectively in groups. This helped them understand math concepts better. Gamit, Antolin & Gabriel (2017), stated on their research that students who learned math through cooperative learning performed better. They also developed a more positive attitude toward math. Lim (2019) research showed that students performed better in math when they worked in groups they were comfortable with. All-female groups performed the best, followed by mixed-gender groups. A study by Chang & Brickman (2018) found that group work is most effective when students are given clear roles and guidance. Without structure, some students felt group work was unhelpful.

The correlation result indicates that while a slight negative trend exists, it is not strong enough to be meaningful. On the positive side, the weak connection highlights that other factors might play a bigger role in influencing student outcomes, encouraging teachers to explore more effective strategies to boost engagement and performance (Wang et al., 2019; Martin & Collie, 2019). However, on the negative side, the non-significant result warns that focusing too much on these specific factors may not lead to substantial improvements and could even misguide educational efforts if not carefully considered (Eccles & Wigfield, 2020; Linnenbrink-Garcia & Patall, 2016).

The analysis reveals no statistically significant correlation between students' perceptions of collaborative learning and their engagement in math. This suggests a need for educators to evaluate not just the presence of collaborative practices, but the quality and student perceptions of these practices. Enhancing the effectiveness of collaborative learning may involve teacher training, clearer role definitions in group tasks, and feedback systems that reinforce student contributions and accountability.

5. CONCLUSION

This study examined the relationship between students' perceptions of collaborative learning and their engagement in math. Based on the findings, it can be concluded that:

1. students generally have a moderate level of perception of collaborative learning in mathematics;

2. students demonstrate a moderate level of engagement in mathematics across behavioral, emotional, cognitive, and social dimensions; and,

3. students' perceptions of collaborative learning are not significantly related to their engagement in mathematics.

6. RECOMMENDATION

Based on the findings and conclusion of the study, the following recommendations are made.

1. Teachers may review and refine the design and implementation of collaborative learning activities in mathematics classes to better align with students' learning needs and classroom context.

2. Teachers may consider integrating a variety of instructional strategies alongside collaborative learning to support different dimensions of student engagement, including behavioral, emotional, cognitive, and social aspects.

3. Future research may examine other variables that may be associated with students' engagement in mathematics, as the present study found no significant relationship between students' perceptions of collaborative learning and their engagement.

7. ACKNOWLEDGEMENT

The researcher wants to extend her utmost gratitude to her family for their support in all forms, to her research adviser, Dr. Jenyliza Ucang, for the constructive feedback and continuous encouragement in all phases of the study, to the respondents for their time and cooperation. Above all, the researcher give thanks to the God Almighty for His grace and provision of

resources and mental fortitude to complete this academic milestone.

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