Exploring the Influence of Teacher-Student Relationships, Technology Integration, and Classroom Environment on Student Engagement in Mathematics

Rince Cheal A. Entice, MAEd

J1 Teacher, North Carolina, USA

DOI: https://dx.doi.org/10.51244/IJRSI.2025.12120094

Received: 29 December 2025; Accepted: 03 January 2026; Published: 13 January 2026

ABSTRACT

This study examines the factors influencing student engagement in mathematics, with particular emphasis on teacher–student relationships, classroom technology integration, and the classroom environment within a Philippine educational context. Data were gathered through student surveys and analyzed using regression techniques to determine the influence of each factor on mathematics engagement. The findings indicate that positive teacher–student relationships significantly enhance student engagement, as supportive, trusting, and communicative interactions encourage students' active participation in learning. Classroom technology integration also shows a meaningful positive influence, as the effective use of digital tools increases students' interest, motivation, and involvement in mathematics lessons. Among the factors examined, the classroom environment emerges as the strongest predictor of student engagement, highlighting the importance of a supportive, organized, inclusive, and stimulating learning atmosphere. Overall, the results underscore the critical role of nurturing strong teacher–student relationships, implementing technology meaningfully, and cultivating positive classroom environments in promoting student engagement in mathematics, which may ultimately contribute to improved learning outcomes and sustained interest in the subject.

Keywords: Classroom Engagement, Student Engagement, Teacher-Student Relationships, Techonology Integration

INTRODUCTION

In the rapidly evolving educational landscape, fostering student engagement has become a critical priority for educators, particularly in subjects like mathematics, where student interest and motivation can often wane. Engagement in mathematics is not merely about paying attention in class; it encompasses emotional, behavioral, and cognitive investment in learning. Higher levels of engagement are strongly linked to improved academic performance, a deeper understanding of mathematical concepts, and a sustained interest in the subject, which is crucial in preparing students for future challenges in a technology-driven world. International assessments like the Programme for International Student Assessment (PISA) have highlighted significant variations in student performance in mathematics across different countries, underscoring the need to understand and address the factors influencing student engagement in this critical subject (OECD, 2021).

However, achieving high levels of student engagement in mathematics is a complex challenge influenced by various factors within the educational environment. Among these factors, the teacher-student relationship, technology integration, and classroom environment have emerged as pivotal determinants of how students connect with and participate in their learning experiences.

The teacher-student relationship is foundational to the learning process, where a positive, supportive, and understanding rapport between teachers and students can create a conducive learning atmosphere. When students feel valued and understood by their teachers, they are more likely to be motivated and engaged in their academic pursuits, particularly in subjects that students often find challenging, like mathematics.

Research indicates that a positive teacher-student relationship is crucial for effective mathematics learning in the Philippines. Teacher engagement, characterized by behaviors like consistent focus and individual attention, is

strongly correlated with students' motivation to learn mathematics (Doño & Mangila, 2021). A transformative approach to teaching, emphasizing active student participation and cultural enactment, can foster a cordial teacher-student relationship (Dahal, 2019). The teaching-learning environment, particularly its organization, structure, and teacher participation, significantly influences student success in mathematics (Pua & Macutay, 2020). Students who adopt a deep approach to learning and studying tend to perform better in mathematics (Pua & Macutay, 2020). Furthermore, study orientations of students are highly correlated with their academic performance in mathematics, as measured by their Grade Point Average (Guinocor et al., 2020). These findings underscore the importance of fostering positive teacher-student relationships and creating supportive learning environments to enhance mathematics education in the Philippines.

In parallel, the integration of technology in the classroom has become increasingly prevalent, offering innovative ways to teach and learn mathematics. Technology can enhance engagement by providing interactive and personalized learning experiences, making abstract mathematical concepts more tangible and accessible. However, the effectiveness of technology integration is contingent upon how well it is implemented and perceived by students.

Recent studies highlight the positive impact of technology integration on student engagement and performance in mathematics education. Technology-assisted lessons significantly improved student performance and engagement in mathematics (Agricula et al., 2024). Problem-based learning was found to partially mediate the relationship between technology integration and student engagement in mathematics (Llorente & Tado, 2024). Mathematics teachers generally exhibit positive attitudes towards using technology in teaching, with male teachers showing more favorable attitudes than females (Marpa, 2020). However, the effectiveness of technology-enhanced resources in higher education mathematics remains unclear, with a lack of studies specifically focusing on student engagement with technology in undergraduate mathematics (Ní Shé et al., 2023). These findings suggest that while technology integration can enhance mathematics education, more research is needed to fully understand its impact and develop comprehensive frameworks for its implementation in higher education settings.

The classroom environment itself also plays a crucial role in shaping students' engagement. A wellorganized, resource-rich, and supportive classroom setting can significantly impact students' willingness to participate and immerse themselves in the learning process. Elements such as the physical layout, availability of learning resources, and the overall psychological climate contribute to how students perceive and interact with the learning environment.

Research highlights the importance of creating emotionally supportive and engaging classroom environments for effective mathematics instruction and student engagement. Positive interactions between teachers and students, well-organized classroom settings, and inclusive teaching practices are essential for fostering deeper learning and enhancing mathematical performance (Berlin & Cohen, 2020). Instructional support plays a crucial role in boosting student engagement, with evidence showing that female teachers can have a particularly positive effect (Alrajeh & Shindel, 2020). Additionally, learning experiences beyond the classroom can significantly enhance student engagement across cognitive, affective, and behavioral dimensions, promoting critical thinking, problem-solving skills, and positive attitudes toward mathematics (Kusmaryono & Wijayanti, 2023). Successful mathematics classrooms are characterized by effective organization, diverse teaching methods, and active teacher involvement (Pua & Macutay, 2020). For optimal mathematics outcomes, students must cultivate genuine interest, understanding, and positive emotions, while teachers should focus on facilitating deep learning approaches and delivering structured, engaging lessons (Berlin & Cohen, 2020).

Despite the recognized importance of teacher-student relationships, technology integration, and classroom environment, empirical research examining their individual impacts on student engagement in mathematics is still developing. This study aims to investigate each of these factors separately to understand how they influence students' engagement in mathematics. By isolating and analyzing these variables, this research will provide insights into how each element contributes to or detracts from student engagement. The findings will help educators and policymakers refine strategies to enhance student involvement and success in mathematics, ultimately fostering a more effective learning environment.

Research Questions

This study aims to investigate the relationship of teacher-student relationships, technology integration, and classroom environment on student engagement in Mathematics. Specifically, it sought to answer the following questions:

1. What is the level of the teacher-student relationship as perceived by students in terms of:
    1.1 Closeness and Trust
    1.2 Positive and Supportive
    1.3 Open Communication
2. What is the level of classroom technology integration as perceived by students?
3. What is the level of the classroom environment as perceived by students in terms of:
    3.1 Positive and Supportive
    3.2 Engaging and Stimulating
    3.3 Orderly and Organized
    3.4 Inclusive and Respectful
4. What is the level of student engagement in mathematics as perceived by students?
5. Is there a significant relationship between the perceived teacher-student relationship and students' engagement in mathematics?
6. Is there a significant relationship between the perceived classroom technology integration and students' engagement in mathematics?
7. Is there a significant relationship between the perceived classroom environment and students' engagement in mathematics?
8. Does the perceived teacher-student relationship influence students' engagement in mathematics?
9. Does the perceived classroom technology integration influence students' engagement in mathematics?
10. Does the perceived classroom environment integration influence students' engagement in mathematics?

LITERATURE REVIEW

Student Engagement in Mathematics

Student engagement is a cornerstone of effective mathematics learning and plays a crucial role in ensuring retention and success in STEM fields (Lo & Hew, 2021). Engagement in this context includes behavioral, emotional, and cognitive dimensions, which can be significantly enhanced through various instructional approaches. One such approach is the flipped classroom model, which has demonstrated considerable promise in boosting student engagement in mathematics. This model, characterized by delivering instructional content outside of class and using class time for interactive activities, has been associated with improved student interaction, increased course satisfaction, and enhanced understanding of mathematical concepts (Lo & Hew, 2021).

Despite its benefits, the flipped classroom approach requires careful implementation. Cevikbas and Kaiser (2021) emphasize the necessity of a well-developed interactive design and effective social interaction to successfully leverage flipped learning. They highlight that negative perceptions of the model, as well as issues such as

incomplete pre-class tasks, can adversely affect student engagement. These challenges underscore the need for thoughtful integration of flipped learning strategies and consideration of student feedback.

Perceived Organizational Support and Work Engagement

Moreover, research indicates that collaborative technologies and teacher-created videos can further contribute to increased student engagement in mathematics (Bond, 2020). These tools offer opportunities for more interactive and personalized learning experiences, which are integral to maintaining student interest and participation.

However, measuring engagement within technology-mediated learning environments remains a complex task. Effective assessment of engagement requires adaptable methods that can accurately capture the multifaceted nature of student involvement (Henrie et al., 2015). This complexity necessitates ongoing research to develop and refine strategies for evaluating engagement in technologically enhanced educational settings

In summary, while the flipped classroom approach and technology integration offer promising avenues for enhancing student engagement in mathematics, there is a need for continued research. Future studies should focus on exploring additional factors such as attendance, mathematics anxiety, and self-regulation, as well as developing effective methods for measuring engagement in technology-mediated contexts (Lo & Hew, 2021).

Teacher-Student Relationships on Students' Engagement

Research consistently demonstrates that positive teacher-student relationships (TSRs) are crucial for enhancing student engagement in mathematics and science. Longitudinal studies reveal that high-quality TSRs predict improved engagement across multiple indicators, including psychological engagement, academic performance, and school attendance (Quin, 2017). The dynamics of TSRs are significant, with a higher proportion of positive relationships compared to negative ones correlating with greater school engagement (Martin & Collie, 2019). This balance underscores the importance of nurturing supportive and encouraging interactions between teachers and students.

Supportive TSRs are strongly associated with increased student engagement and achievement in mathematics. However, it is notable that higher-achieving students often receive more encouragement, highlighting a disparity in support levels (Kelly & Zhang, 2016). This observation emphasizes the need for equitable support across diverse student populations to ensure broad-based engagement.

The integration of technology in mathematics education also plays a pivotal role in boosting student engagement. Effective use of technological tools can enhance pedagogical relationships and teaching strategies. Exemplary teachers leverage technology to better understand individual student needs and to foster studentcentered learning approaches. This technological integration not only supports personalized learning but also increases student engagement with mathematical content (Attard & Holmes, 2020).

In summary, fostering positive TSRs and strategically incorporating technology are both essential for enhancing student engagement in mathematics. These findings highlight the need for educators to focus on building supportive relationships and utilizing technological resources to create a more engaging and effective mathematics learning environment.

Classroom Environment on Students' Engagement

Recent research underscores the significant impact of the classroom environment on student engagement across various educational contexts. A positive and well-structured classroom setting plays a crucial role in fostering student involvement and motivation, which in turn influences overall learning experiences and academic success.

The physical design of classrooms has been shown to significantly affect student engagement. Flexible classroom spaces and low-cost learning tools facilitate active learning and encourage student participation. For instance, movable furniture and collaborative workstations allow students to engage in diverse learning activities, adapting their environment to meet different instructional needs. This adaptability enhances engagement by supporting varied learning styles and promoting interactive experiences (Rands & GansemerTopf, 2017).

In addition to physical design, teacher-student interactions within the classroom environment are critical. Positive and supportive interactions between teachers and students create a nurturing atmosphere that encourages active participation and emotional investment in learning. Effective communication, encouragement, and individualized support from teachers contribute to a more engaging learning environment, strengthening studentteacher relationships and enhancing overall engagement (Wang, 2017).

Experiential learning has also emerged as a promising approach to improving classroom engagement. This method, which aligns with constructivist principles and positive psychology, emphasizes hands-on, realworld experiences that actively involve students and encourage reflection on their learning. By incorporating experiential activities into the curriculum, educators can make learning more relevant and engaging, thereby increasing student motivation and involvement (Kong, 2021).

In specific educational contexts, such as language learning, the classroom environment's role in enhancing engagement is particularly notable. Creating a supportive and responsive environment can significantly impact students' willingness to participate in language learning activities. Providing opportunities for authentic communication and ensuring a safe, inclusive space contribute to a more engaging learning experience (Ye, 2024).

Overall, these findings highlight the importance of considering both physical and interpersonal aspects of the classroom environment. A well-designed physical space, combined with positive teacher-student interactions and engaging learning approaches, creates a holistic environment that supports student motivation and participation. Educators should address these elements to foster a positive and engaging learning atmosphere, ultimately enhancing student success across various educational levels and subjects

RESEARCH METHODOLOGY

Research Design

The study employed a descriptive-correlational design, which was appropriate for examining the relationships between variables and understanding how different factors influenced student engagement in mathematics. This design allowed for the investigation of correlations between perceived teacher-student relationships, technology integration, classroom environment, and student engagement without manipulating the study environment.

Respondents

The respondents of this study were selected from the student population at Kalabaylabay Integrated School, specifically focusing on students from Grades 7 to 10. Using raosoft calculator, a sample size of 107 students was determined to ensure a representative analysis. This stratified sampling approach ensured that each grade level was adequately represented in the study, allowing for a comprehensive exploration of student engagement in mathematics across different stages of secondary education.

The distribution of respondents across grade levels is as follows:

Grade Level	**Population**	**Sample Size**
Grade 7	35	25
Grade 8	34	25
Grade 9	40	29
Grade 10	38	28
Total	**147**	**107**

Instruments of the Study

The researcher-made instrument was meticulously developed to ensure it effectively measured the objectives of the study. It is organized into several sections, each targeting a different aspect of student engagement in

mathematics. The Teacher-Student Relationship variable is divided into three sub-dimensions: Closeness and Trust, Support and Encouragement, and Open Communication. Each sub-dimension contains eight items, which respondents answer using a 5-point Likert scale. The reliability of the

Teacher-Student Relationship variable, including all four sub-dimensions, was confirmed with a Cronbach's alpha value of 0.88, indicating excellent internal consistency. The Classroom Environment variable is assessed through four categories: Positive and Supportive, Engaging and Stimulating, Orderly and Organized, and Inclusive and Respectful. Each category features eight items, and responses are collected using a 5-point Likert scale. The overall reliability of the Classroom Environment variable, encompassing all categories, was measured with a Cronbach's alpha of 0.90, reflecting very high internal consistency. The Technology Integration variable is measured by eight items focusing on various aspects of technology use in the classroom. Respondents rate their agreement with each item on a 5-point Likert scale. This variable exhibited a Cronbach's alpha of 0.86, indicating strong reliability.

Finally, the Mathematics Engagement variable is evaluated through eight items that explore students' interest, motivation, and involvement in mathematics. The reliability of this variable was confirmed with a Cronbach's alpha value of 0.87, demonstrating high internal consistency. The validity of the instrument was ensured through expert review by a school head, a master teacher, and a college professor. Their insights were instrumental in refining the questionnaire to ensure it accurately measures the intended constructs.

Data Gathering Procedure

The data gathering process involved several critical steps to ensure a thorough and ethical approach. Initially, permission was sought and obtained from the school head of Kalabaylabay Integrated School by presenting the research proposal, outlining the objectives, and explaining the study's potential benefits. Following this approval, informed consent was secured from all participants, including written consent from students and their parents or guardians. This step was crucial to ensure that all participants were fully aware of the study's purpose, the voluntary nature of their involvement, and the confidentiality of their responses.

An orientation session for the respondents was conducted next, providing detailed information about the study, including its goals, the importance of honest responses, and the procedures for completing the questionnaire. This orientation helped clarify any doubts and ensured that participants clearly understood their role in the research.

The questionnaires were then administered during regular class sessions to minimize disruption. Research assistants or designated teachers supervised the administration, offering assistance with any questions and ensuring the process was conducted smoothly and fairly.

Upon completion, the questionnaires were collected immediately, with follow-up checks to account for any missing or incomplete responses. Completed questionnaires were securely stored to maintain confidentiality and data integrity. The collected data were then entered into a statistical software program for analysis, with preliminary checks performed to ensure accuracy and consistency. Discrepancies were corrected **Data Analysis**

The data were analyzed using various statistical techniques. Descriptive statistics such as mean and standard deviation were used to summarize the levels of the teacher-student relationship, technology integration, classroom environment, and student engagement. Pearson R was employed to determine the relationships between these variables. Additionally, regression analysis was used to assess the influence of the teacher-student relationship, technology integration, and classroom environment on student engagement in mathematics.

Ethical Considerations

Ethical considerations were carefully adhered to throughout the research to protect participants' rights and welfare. Informed consent was obtained from all student respondents, ensuring they understood that participation was voluntary, and they could withdraw at any time without repercussions. Additionally, parental consent was secured, recognizing the need to involve parents when minors are participants in research. Confidentiality was a priority, with all data anonymized and securely stored. Participants were assured that their responses would be

used solely for research purposes and reported in aggregate form to prevent individual identification. The study was conducted with respect for the dignity and privacy of all involved, ensuring that ethical standards were maintained at every stage

RESULTS AND DISCUSSION

This section presents the findings according to the study's research questions. To compare the mean and find out the significance between variables, multiple linear regression was computed using IBM SPSS 26.0.

Problem 1. What is the level of the teacher-student relationship as perceived by students in terms of:

Closeness and Trust

Positive and Supportive

Open Communication

Table 1.1 Closeness and Trust

Indicators	Mean	SD	Description	Interpretation
1 I feel comfortable talking to my teacher about my concerns.	3.81	0.98	Agree	High
2 My teacher seems to understand my feelings.	3.63	0.96	Agree	High
3 I trust my teacher to be fair and honest with me.	4.13	0.93	Agree	High
4 I feel like my teacher cares about me as a person, not just as a student.	3.96	0.90	Agree	High
5 My teacher makes me feel safe to express my opinions in class.	3.54	0.92	Agree	High
6 I feel like I can be myself around my teacher.	3.73	1.01	Agree	High
7 My teacher helps me to overcome challenges in my learning.	4.11	0.97	Agree	High
8 My teacher respects my ideas and opinions.	3.85	0.96	Agree	High
Overall	**3.85**	**.061**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 1.1 presents the level of teacher-student relationships as perceived by students, specifically in terms of "Closeness and Trust." The table includes various indicators, each reflecting different aspects of this relationship, such as comfort in discussing concerns, feeling understood, trust in fairness, and feeling cared for by teachers. The mean scores for these indicators range from 3.54 to 4.13, all falling within the "Agree" category and interpreted as "High." This suggests that students generally perceive a strong and positive relationship with their teachers.

The highest mean score of 4.13 is observed for the statement "I trust my teacher to be fair and honest with me," indicating that students place significant trust in their teachers' integrity and fairness. This high level of trust is

crucial, as it underpins students' willingness to engage in the classroom and their overall sense of security in the learning environment. Conversely, the lowest mean score of 3.54 is for the statement "My teacher makes me feel safe to express my opinions in class." While still categorized as "High," this lower score suggests that there might be room for improvement in fostering an even more open and supportive classroom atmosphere where students feel entirely comfortable sharing their thoughts.

The overall mean score for the "Closeness and Trust" dimension is 3.85, with a standard deviation of 0.61, indicating a consistent perception among students that their relationship with their teachers is strong and positive. This consistency in responses reflects a shared experience among students, suggesting that most feel similarly about their interactions with their teachers.

The implications of these findings are significant for the learning environment. The strong teacherstudent relationship, characterized by high levels of trust, understanding, and respect, is essential for creating a supportive educational setting. However, the slightly lower score related to the safety of expressing opinions indicates a potential area for growth. Teachers may need to continue building an inclusive environment that encourages all students to participate fully and feel valued in their contributions. Overall, while the teacherstudent relationship is strong, ongoing efforts to nurture and enhance these bonds are vital to ensuring that students feel supported and are able to thrive academically and emotionally.

Table 1.2 Positive and Supportive

Indicators	**Mean**	**SD**	**Description**	**Interpretation**
1 My teacher encourages me to try my best in class.	4.09	0.93	Agree	High
2 My teacher provides helpful feedback that helps me improve.	3.95	0.85	Agree	High
3 My teacher is available to help me when I need it.	3.78	1.01	Agree	High
4 My teacher believes in my ability to succeed.	3.95	0.97	Agree	High
5 My teacher makes me feel confident about my learning.	3.85	0.95	Agree	High
6 My teacher helps me to understand the material even when it's difficult.	3.98	0.92	Agree	High
7 My teacher helps me to understand the material even when it's difficult.	3.88	1.05	Agree	High
8 My teacher helps me to overcome challenges in my learning.	3.81	0.87	Agree	High
Overall	**3.91**	**0.68**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 1.2 illustrates the students' perceptions of the "Positive and Supportive" aspects of their relationship with their teachers. The indicators capture various dimensions of this relationship, including encouragement, feedback, availability, and belief in students' abilities. The mean scores for these indicators range from 3.78 to 4.09, all of which fall under the "Agree" category with a "High" interpretation. This reflects a generally positive view of how supportive and encouraging teachers are in the eyes of their students.

The highest mean score of 4.09 is for the statement "My teacher encourages me to try my best in class." This suggests that students feel strongly supported by their teachers, who actively motivate them to put forth their best effort. This encouragement is crucial in fostering a growth mindset and helping students to persist even when faced with challenges. On the other hand, the lowest mean score, 3.78, is associated with the statement "My teacher is available to help me when I need it." While still interpreted as "High," this slightly lower score may indicate that students feel there could be more availability or accessibility when they seek help from their teachers.

Overall, the mean score for the "Positive and Supportive" dimension is 3.91, with a standard deviation of 0.68. This suggests a generally consistent perception among students that their teachers are supportive and positive influences in their learning journey. The relatively low standard deviation indicates that most students share a similar level of agreement with these statements.

The findings emphasize the critical role that positive reinforcement and support play in students' academic experiences. Teachers who consistently provide encouragement and are available to assist students contribute to a more confident and resilient student body. However, the slightly lower score on teacher availability hints at an area where students might benefit from more opportunities to seek help. In summary, while students perceive their teachers as positive and supportive overall, enhancing accessibility could further strengthen these relationships and support students' success.

Table1.3 Open Communication

Indicators	Mean	SD	Description	Interpretation
1. I feel comfortable asking my teacher questions in class.	3.76	1.00	Agree	High
2. My teacher encourages me to share my ideas and thoughts in class.	3.69	1.01	Agree	High
3. My teacher is open to hearing different perspectives from students.	3.75	0.99	Agree	High
4. I feel like I can have a respectful conversation with my teacher.	3.97	0.85	Agree	High
5. My teacher provides clear and understandable instructions	3.94	0.96	Agree	High
6. My teacher gives me opportunities to participate in class.	3.97	0.98	Agree	High
7. My teacher makes me feel like my voice is heard in class.	3.71	0.92	Agree	High
8. My teacher creates a safe space for open communication in class.	3.77	0.98	Agree	High
Overall	**3.82**	**0.58**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 1.3 focuses on the students' perceptions of "Open Communication" within the classroom, highlighting how comfortable they feel engaging in dialogue with their teachers. The indicators cover various aspects of communication, such as the ease of asking questions, sharing ideas, and feeling heard in class. The mean scores range from 3.69 to 3.97, all of which are classified under the "Agree" category with a "High" interpretation. This suggests that students generally perceive the communication in their classrooms as open and supportive.

The highest mean score of 3.97 is shared by two indicators: "I feel like I can have a respectful conversation with my teacher" and "My teacher gives me opportunities to participate in class." These scores reflect that students feel their teachers are respectful and provide ample opportunities for them to engage in classroom discussions. This is a positive sign, as it indicates that students are not only encouraged to participate but also feel that their contributions are valued and respected, which is essential for a healthy learning environment.

On the other hand, the lowest mean score of 3.69 is for the statement "My teacher encourages me to share my ideas and thoughts in class." Although this score is still interpreted as "High," it is the lowest among the indicators, suggesting that there might be room for teachers to more actively encourage students to express their ideas. Ensuring that all students feel equally encouraged to participate could help to foster even more open and dynamic classroom discussions.

The overall mean score for the "Open Communication" dimension is 3.82, with a standard deviation of 0.58. This indicates that students generally agree that their classroom environment supports open communication, with a relatively small variation in their perceptions. The consistency of these responses highlights that most students experience a similar level of comfort and openness in their interactions with their teachers.

These findings underscore the importance of open communication in the classroom. When students feel comfortable asking questions, sharing ideas, and knowing their voices are heard, it not only enhances their learning experience but also builds their confidence. However, the slightly lower score in encouraging ideasharing suggests an area where teachers might focus more attention. By actively fostering an environment where every student feels encouraged to contribute, teachers can further enhance the openness and inclusiveness of classroom communication.

Table 1.4 Summary of Variables

Variables	Mean	SD	Interpretation
Closeness and Trust	3.85	0.61	**High**
Positive and Supportive	3.91	0.68	**High**
Open Communication	3.82	0.59	**High**
Overall	**3.86**	**0.57**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

The summary of variables presents the overall perceptions of students regarding their relationship with their teachers across three key dimensions: Closeness and Trust, Positive and Supportive, and Open Communication. The mean scores for these variables indicate that students generally hold a favorable view of their interactions with their teachers, with all variables falling under the "High" interpretation.

The "Positive and Supportive" dimension has the highest mean score of 3.91, with a standard deviation of 0.68. This suggests that students particularly appreciate the encouragement, support, and belief their teachers have in their abilities, which are crucial elements for fostering a positive learning environment. The "Closeness and Trust" dimension follows closely with a mean score of 3.85 and a standard deviation of 0.61, indicating strong relationships built on mutual respect and understanding. Lastly, the "Open Communication" dimension, with a mean score of 3.82 and a standard deviation of 0.59, reflects that students generally feel comfortable and supported in sharing their ideas and engaging in dialogue with their teachers.

The overall mean score across all dimensions is 3.86, with a standard deviation of 0.57, further reinforcing that students perceive their relationships with teachers as highly positive. The relatively low standard deviation across all variables suggests consistency in student perceptions, indicating that these positive interactions are a common experience among the majority of students.

In summary, the high scores across all three dimensions emphasize the strength of the teacher-student relationship, which is characterized by trust, support, and open communication. These factors are integral to creating an educational environment where students feel valued, motivated, and confident in their academic pursuits.

Problem 2. What is the level of classroom technology integration as perceived by students?

Table 2 Technology Integration as perceived by students

Indicators	**Mean**	**SD**	**Description**	**Interpretation**
1. Technology is used regularly in my math class.	3.80	0.88	Agree	High
2. The technology used in my math class helps me to understand math concepts better.	3.68	0.80	Agree	High
3. I find the technology used in my math class engaging and interesting.	3.74	0.91	Agree	High
4. I feel confident using the technology in my math class.	3.01	0.10	Neutral	Moderate
5. The technology used in my math class makes learning math more enjoyable.	3.72	0.92	Agree	High
6. Technology helps me to work collaboratively with my classmates in math.	3.69	0.91	Agree	High
7. Technology provides me with opportunities to explore math concepts in different ways.	3.79	0.91	Agree	High
8. I feel like technology is integrated effectively into my math class.	3.79	0.89	Agree	High
Overall	**3.65**	**0.54**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 2 presents the students' perceptions of classroom technology integration, specifically in their math classes. The indicators cover various aspects of technology use, including its regularity, effectiveness in enhancing understanding, engagement, and the opportunity it provides for collaborative and exploratory learning. The mean scores for these indicators range from 3.01 to 3.80, predominantly falling within the "Agree" category, interpreted as "High," except for one indicator.

The highest mean score of 3.80 is shared by two statements: "Technology is used regularly in my math class" and "Technology provides me with opportunities to explore math concepts in different ways." These scores indicate that students frequently experience technology use in their math classes, and they appreciate the diverse ways it helps them engage with math concepts. The consistent use of technology seems to be a strong point in their learning experience, suggesting that technology is well-integrated into the curriculum to support varied learning methods.

On the other hand, the lowest mean score of 3.01 is for the statement "I feel confident using the technology in my math class," which falls under the "Neutral" category and is interpreted as "Moderate." This suggests that while students generally agree on the benefits of technology integration, their confidence in using it might not be as strong. This lower confidence level could be due to various factors, such as a lack of familiarity with the technology or insufficient training in its use. Addressing this issue could enhance the overall effectiveness of technology integration by ensuring that students not only benefit from technology but also feel confident in their ability to use it effectively.

The overall mean score for the level of classroom technology integration is 3.65, with a standard deviation of 0.54. This overall "High" interpretation reflects that students generally perceive technology as a valuable and well-integrated part of their math learning experience. The relatively low standard deviation indicates that students have a fairly consistent view of the role of technology in their learning environment.

In summary, the high scores across most indicators suggest that technology is effectively integrated into math classes, enhancing understanding, engagement, and exploration of concepts. However, the moderate confidence level in using the technology highlights an area where additional support and training could be beneficial. Ensuring that students feel both engaged and confident with the technology they use can further strengthen the impact of technology integration on their learning outcomes.

Problem 3: What is the level of the classroom environment as perceived by students in terms of:

Positive and Supportive

Engaging and Stimulating

Orderly and Organized

Inclusive and Respectful

Table 3.1 Positive and Supportive

Indicators	Mean	SD	Description	Interpretation
1. I feel comfortable and safe in the classroom.	3.83	1.20	Agree	High
2. My classmates are friendly and welcoming.	3.96	1.00	Agree	High
3. The teacher creates a positive and encouraging atmosphere.	3.61	0.97	Agree	High
4. I feel like I belong in this classroom	4.06	0.97	Agree	High
5. I feel supported by my classmates and teacher when I need help.	3.81	1.16	Agree	High
6. The classroom is a place where I feel comfortable taking risks and trying new things.	3.79	0.97	Agree	High
7. I feel respected by my classmates and teacher.	3.83	1.08	Agree	High
8. I feel like I can be myself in this classroom.	3.80	0.97	Agree	High

Overall	**3.84**	**0.71**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 3.1 provides an overview of students' perceptions of their classroom environment in terms of being "Positive and Supportive." The indicators measure various aspects of the classroom environment, such as comfort, friendliness, and support from both classmates and the teacher. The mean scores for these indicators range from 3.61 to 4.06, all falling under the "Agree" category with a "High" interpretation, suggesting that students generally view their classroom environment as positive and supportive.

The highest mean score of 4.06 is associated with the statement "I feel like I belong in this classroom." This indicates that students have a strong sense of belonging and are likely to feel integrated into the classroom community. This sense of belonging is crucial for student engagement and overall well-being, as it contributes to a supportive learning environment where students feel valued and included.

Conversely, the lowest mean score of 3.61 is for the statement "The teacher creates a positive and encouraging atmosphere." Although this score is still interpreted as "High," it is the lowest among the indicators, suggesting that there might be some variation in how students perceive the teacher's role in fostering a positive atmosphere. This could point to areas where additional efforts might be needed to ensure that all students consistently experience an encouraging and supportive classroom climate.

The overall mean score for the "Positive and Supportive" dimension is 3.84, with a standard deviation of 0.71. This reflects a generally favorable perception of the classroom environment, with students consistently reporting that they feel supported, respected, and comfortable in their classroom setting. The relatively low standard deviation indicates that these perceptions are fairly uniform among students, suggesting a shared positive experience.

In summary, the data highlights that students view their classroom environment as largely positive and supportive, with strong feelings of belonging and comfort. While the overall perception is very high, the slightly lower score related to the teacher's role in creating a positive atmosphere suggests a potential area for improvement. Ensuring that every student feels fully supported and encouraged by the teacher can further enhance the positive classroom environment and contribute to a more inclusive and supportive learning experience.

Table 3.2 Engaging and Stimulating

Indicators	**Mean**	**SD**	**Description**	**Interpretation**
1. The lessons are interesting and engaging.	3.72	0.96	Agree	High
2. I feel challenged and motivated to learn in this classroom.	3.90	0.89	Agree	High
3. There are opportunities to learn in different ways (e.g., group work, individual work, technology).	3.92	0.92	Agree	High
4. The teacher provides a variety of activities and materials to keep me interested.	3.70	1.03	Agree	High
5. I feel like I am making progress in my learning in this classroom.	3.82	0.85	Agree	High

6. The classroom is equipped with the resources I need to succeed.	3.87	1.05	Agree	High
7. I feel like I am learning valuable skills and knowledge in this classroom.	3.82	0.96	Agree	High
8. I look forward to coming to this class.	3.82	1.05	Agree	High
Overall	**3.82**	**0.67**	**Agree**	High

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 3.2 evaluates the classroom environment from the perspective of being "Engaging and Stimulating," focusing on how well the classroom captures students' interest and fosters a motivating learning atmosphere. The indicators reveal students' perceptions about the dynamism of lessons, the variety of learning experiences, and the availability of resources. The mean scores for these indicators span from 3.70 to 3.92, all falling into the "Agree" category with a "High" interpretation, suggesting that students generally find their classroom environment both engaging and stimulating.

The statement "There are opportunities to learn in different ways (e.g., group work, individual work, technology)" received the highest mean score of 3.92. This indicates that students appreciate the diverse methods of learning available to them, which cater to various learning preferences and help keep the educational experience vibrant. Additionally, "I feel challenged and motivated to learn in this classroom" scored 3.90, underscoring that students find the classroom environment both stimulating and motivating, which drives their engagement with the material.

Conversely, the statement "The teacher provides a variety of activities and materials to keep me interested" has the lowest mean score of 3.70, though it remains in the high category. This suggests that while students recognize the variety of activities provided, there might be opportunities to enhance the appeal and effectiveness of these resources to better capture and sustain student interest.

The overall mean score for the "Engaging and Stimulating" dimension is 3.82, with a standard deviation of 0.67. This figure reflects a broadly positive perception among students regarding the engagement and stimulation offered by their classroom environment. The relatively narrow standard deviation indicates that students' views on this aspect of their learning environment are quite consistent.

In summary, students generally view their classroom as highly engaging and stimulating, appreciating the variety of learning opportunities and the motivational aspects of their lessons. The area with the most potential for improvement is in providing an even broader range of engaging activities and materials. By enhancing the variety and effectiveness of classroom resources, educators can further boost student interest and maintain a stimulating learning environment.

Table 3.3 Orderly and Organized

Indicators	**Mean**	**SD**	**Description**	**Interpretation**
1. The classroom is organized and wellmaintained.	3.80	1.00	Agree	High
2. The teacher provides clear instructions and expectations.	3.92	0.95	Agree	High
3. There are clear rules and procedures in the classroom.	3.92	0.95	Agree	High

4. The classroom is a place where I can focus and learn effectively.	3.77	0.96	Agree	High
5. The teacher manages the classroom effectively, ensuring a productive learning environment.	3.69	0.94	Agree	High
6. The classroom is equipped with the necessary technology and resources.	3.79	0.82	Agree	High
7. The classroom is a place where I feel safe to focus on my learning.	3.62	0.97	Agree	High
8. I feel like the classroom is a place where I can learn without distractions.	3.55	0.98	Agree	High
Overall	**3.76**	**0.59**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 3.3 provides an assessment of the classroom environment in terms of being "Orderly and Organized." This dimension evaluates the extent to which the classroom is well-maintained, the clarity of instructions and rules, and the overall effectiveness of the learning environment. The indicators show students' perceptions of the organization, management, and resources available in their classroom. The mean scores for these indicators range from 3.55 to 3.92, all within the "Agree" category with a "High" interpretation, suggesting that students generally view their classroom environment as orderly and organized.

The highest mean score of 3.92 is associated with the statements "The teacher provides clear instructions and expectations" and "There are clear rules and procedures in the classroom." These scores indicate that students find the structure and clarity of instructions and rules to be particularly strong aspects of their classroom environment. This suggests that clear communication and well-established procedures contribute significantly to an organized and effective learning atmosphere.

On the other hand, the lowest mean score of 3.55 is for "I feel like the classroom is a place where I can learn without distractions." Although this score still falls within the "High" category, it is the lowest among the indicators. This may imply that while students generally feel their classroom is orderly, there might be occasional distractions or issues that affect their ability to focus entirely on learning.

The overall mean score for the "Orderly and Organized" dimension is 3.76, with a standard deviation of 0.59. This reflects a generally positive perception of the classroom's organization and orderliness, with students consistently noting that their learning environment is well-maintained and effectively managed. The relatively low standard deviation indicates that students' opinions are quite uniform regarding the classroom's order and organization.

Hence, students perceive their classroom as being well-organized and effective in supporting their learning. The high scores for clear instructions and established rules highlight strengths in classroom management and structure. However, the slightly lower score related to distractions suggests that there may be areas for improvement to ensure an even more focused learning environment. Enhancing efforts to minimize distractions could further reinforce the classroom's role as a productive and organized space for learning.

Table 3.4 Inclusive and Respectful

Indicators	**Mean**	**SD**	**Description**	**Interpretation**

1. The teacher and classmates treat each other with respect.	3.67	0.97	Agree	High
2. I feel like my voice is heard in this classroom.	3.61	0.92	Agree	High
3. The teacher encourages diversity of thought and opinions.	3.76	0.94	Agree	High
4. I feel like I am a valued member of this classroom community.	3.78	0.94	Agree	High
5. The teacher ensures that everyone feels safe and respected in this classroom.	3.71	0.87	Agree	High
6. I feel comfortable sharing my ideas and opinions in this classroom.	3.74	0.99	Agree	High
7. I feel like I can learn from my classmates and teacher.	3.87	0.87	Agree	High
8. I feel like I am part of a supportive and inclusive learning community.	3.74	0.92	Agree	High
Overall	**3.74**	**0.62**	**Agree**	High

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 3.4 examines the classroom environment in terms of being "Inclusive and Respectful," focusing on how well students feel respected, valued, and included within their learning community. The indicators assess the perceived respect among peers and teachers, the inclusivity of diverse opinions, and the overall sense of belonging. The mean scores for these indicators range from 3.61 to 3.87, all falling within the "Agree" category with a "High" interpretation, indicating that students generally experience a respectful and inclusive environment in their classroom.

The highest mean score of 3.87 is associated with "I feel like I can learn from my classmates and teacher." This suggests that students feel that the classroom environment fosters mutual learning and respect, enhancing their educational experience. Additionally, the statement "I feel like I am a valued member of this classroom community" received a mean score of 3.78, reflecting students' sense of belonging and value within the classroom setting.

Conversely, the lowest mean score of 3.61 is for "I feel like my voice is heard in this classroom." Although still high, this score indicates that some students might feel that their input is not always fully acknowledged. This could suggest an opportunity for improvement in ensuring that every student's contributions are recognized and valued more consistently.

The overall mean score for the "Inclusive and Respectful" dimension is 3.74, with a standard deviation of 0.62. This score reflects a generally positive view among students regarding the inclusivity and respectfulness of their classroom environment. The relatively low standard deviation indicates that students have a consistent perception of the classroom's inclusivity and respect.

In conclusion , students generally perceive their classroom as inclusive and respectful, with strong feelings of being valued and supported. The high scores for learning from classmates and feeling part of the community underscore the positive aspects of respect and inclusivity. However, the slightly lower score related to having one's voice heard suggests a potential area for improvement. Addressing this issue could further enhance the sense of inclusion and ensure that all students feel equally heard and respected in their learning environment.

Table 3.5 Summary of Variables

Variables	Mean	SD	Interpretation
Positive and Supportive	3.84	0.71	High
Engaging and Stimulating	3.82	0.67	High
Orderly and Organized	3.76	0.59	High
Inclusive and Respectful	3.74	0.62	High
Overall	**3.78**	**0.57**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 3.5 provides a summary of students' perceptions of their classroom environment across four key dimensions: Positive and Supportive, Engaging and Stimulating, Orderly and Organized, and Inclusive and Respectful.

The "Positive and Supportive" dimension has a mean score of 3.84 with a standard deviation of 0.71. This indicates that students generally view their classroom as a supportive and encouraging environment where they feel comfortable and valued. The high score reflects a strong perception of a positive atmosphere that fosters student well-being and engagement.

In terms of Engaging and Stimulating, the mean score is 3.82 with a standard deviation of 0.67. This suggests that students find their lessons interesting and motivating. The variety of learning opportunities and resources available in the classroom keeps students engaged and contributes to their overall enthusiasm for learning.

The Orderly and Organized dimension scores a mean of 3.76 with a standard deviation of 0.59. This

indicates that students perceive their classroom as well-maintained and effectively managed. Clear instructions, established rules, and adequate resources help create a productive learning environment where students can focus on their studies.

For the Inclusive and Respectful dimension, the mean score is 3.74 with a standard deviation of 0.62. While students generally feel respected and included in their classroom community, this score suggests there may be slight room for improvement in ensuring that all students feel equally heard and valued.

Overall, the classroom environment is rated highly, with an overall mean score of 3.78 and a standard deviation of 0.57. This reflects a generally positive perception of the learning space, encompassing all the dimensions evaluated. Students experience their classroom as a supportive, engaging, organized, and inclusive environment, though slight variations indicate potential areas for further enhancement to optimize their educational experience.

Problem 4. What is the level of student engagement in mathematics as perceived by students?

Table 4 Mathematics Engagement as perceived by students

Indicators	Mean	SD	Description	Interpretation

1. I am interested in learning math.	3.91	0.95	Agree	High
2. I am motivated to do well in math.	3.60	1.00	Agree	High
3. I find math class enjoyable.	3.64	0.99	Agree	High
4. I am actively involved in my math class.	3.70	0.99	Agree	High
5. I feel like I am learning a lot in my math class.	3.57	0.98	Agree	High
6. I am confident in my ability to solve math problems.	3.64	0.91	Agree	High
7. I am eager to learn new math concepts.	3.67	0.86	Agree	High
8. I am excited to come to math class.	3.72	0.89	Agree	High
Overall	**3.68**	**0.63**	**Agree**	**High**

Note: 1.00-1.80 Very Low; 1.81-2.60 Low; 2.61-3.40 Moderate; 3.41-4.20 High; 4:21-5:00 Very High

Table 4 explores the level of student engagement in mathematics, focusing on various aspects of how students perceive their involvement, interest, and enthusiasm in math classes. The indicators measure students' interest in learning math, their motivation, enjoyment, and overall involvement. The mean scores for these indicators range from 3.57 to 3.91, all falling within the "Agree" category with a "High" interpretation, suggesting that students generally report a high level of engagement in their math classes.

The highest mean score of 3.91 is associated with the statement, "I am interested in learning math." This indicates that students have a strong interest in math, which is a positive sign of engagement. Additionally, the statement "I am excited to come to math class" received a mean score of 3.72, reflecting students' enthusiasm and anticipation for their math lessons.

Conversely, the lowest mean score of 3.57 is for the statement, "I feel like I am learning a lot in my math class." While still high, this score suggests that some students might feel less confident about the learning outcomes from their math classes. This could imply that there might be areas where students need more support or clearer explanations to fully grasp the material.

The overall mean score for student engagement in mathematics is 3.68, with a standard deviation of 0.63. This reflects a generally positive view among students regarding their engagement in math. The standard deviation indicates some variability in students' responses, but the overall perception remains high.

In summary, students generally exhibit a high level of engagement in their math classes, showing strong interest, motivation, and enjoyment. The high scores for interest and excitement suggest that math classes are engaging and stimulating for students. However, the slightly lower score related to feeling like they are learning a lot indicates a potential area for improvement. Addressing this concern could further enhance student engagement and ensure that all students feel they are gaining valuable knowledge from their math classes.

Problem 5. Is there a significant relationship between the perceived teacher-student relationship and students' engagement in mathematics?

Variable	**Teacher and Student Relationship**		
	Closeness and Trust	**Support and Encouragement**	**Open Communication**

	r-value	p-value	r-value	p-value	r-value	p-value
Mathematics Engagement	**.340**	**.000**	**.317**	**.001**	**.309**	**.001**
Overall	**.353**			**.000**		

Table 5 presents the correlation between various aspects of the teacher-student relationship and students' engagement in mathematics. The dimensions considered are Closeness and Trust, Support and Encouragement, and Open Communication, along with an overall measure of the teacher-student relationship.

The data reveals a moderate positive correlation between Closeness and Trust and students' engagement in mathematics, with an r-value of .340 and a p-value of .000. This indicates that stronger feelings of closeness and trust between teachers and students are associated with higher levels of student engagement. The p-value being significantly below the 0.05 threshold confirms that this correlation is statistically significant, suggesting that the relationship is not due to random chance.

Similarly, Support and Encouragement from teachers also show a moderate positive correlation with student engagement, as evidenced by an r-value of .317 and a p-value of .001. This finding means that increased support and encouragement from teachers are linked to greater engagement in mathematics by students. The statistically significant p-value supports the reliability of this relationship.

Open Communication between teachers and students is positively correlated with student engagement, with an r-value of .309 and a p-value of .001. This correlation suggests that better communication contributes to higher student engagement in mathematics. The p-value indicates that this relationship is statistically significant, reinforcing the validity of the finding.

Finally, the overall teacher-student relationship demonstrates a moderate positive correlation with students' engagement, with an r-value of .353 and a p-value of .000. This indicates that a stronger overall relationship between teachers and students is associated with increased student engagement. The p-value confirms that this relationship is statistically significant and robust.

The findings presented corroborate existing research on the importance of the teacher-student relationship in enhancing student engagement, particularly in challenging subjects like mathematics. The positive correlations between Closeness and Trust, Support and Encouragement, and Open Communication with student engagement align with previous studies that emphasize the critical role of a supportive and positive teacher-student relationship in fostering academic motivation and involvement. For instance, Doño and Mangila (2021) found that teacher engagement, characterized by consistent focus and individualized attention, significantly boosts students' motivation to learn mathematics. Similarly, Pua and Macutay (2020) highlighted that an organized and participative teaching environment, which often stems from a strong teacher-student relationship, is vital for student success in mathematics. The current study's findings also echo Dahal's (2019) argument that a transformative approach to teaching, which promotes active student participation and cultural enactment, is essential in building a cordial and effective teacher-student relationship. Thus, this study reinforces the existing literature by demonstrating that various dimensions of the teacher-student relationship are indeed crucial in enhancing student engagement in mathematics, confirming that these relationships are key determinants of academic success in this subject

Problem 6. Is there a significant relationship between the perceived classroom technology integration and students' engagement in mathematics?

Variables	r-value	p-value	Interpretation
Mathematics Engagement and Technology Integration	.324	.001	Significant

Table 6 illustrates the relationship between perceived classroom technology integration and students' engagement in mathematics. The table shows an r-value of .324 and a p-value of .001 for the correlation between Mathematics Engagement and Technology Integration.

The r-value of .324 indicates a moderate positive correlation, suggesting that higher levels of technology integration in the classroom are associated with increased student engagement in mathematics. As technology use in mathematics instruction rises, students are likely to show greater interest and involvement in their learning activities.

The p-value of .001 is well below the conventional significance level of 0.05, confirming that this correlation is statistically significant. This result implies that the observed relationship between technology integration and student engagement is unlikely to be due to chance, reinforcing the validity of the association.

The findings align with existing literature that highlights the positive impact of technology integration on student engagement, particularly in mathematics education. The moderate positive correlation observed in this study supports the notion that incorporating technology into classroom instruction can significantly enhance students' interest and involvement in mathematical learning. This result echoes the conclusions of Llorente and Tado (2024), who found that problem-based learning, when combined with technology, partially mediates the relationship between technology integration and student engagement in mathematics. Additionally, Agricula et al. (2024) reported significant improvements in student performance and engagement in mathematics II due to technology-assisted lessons, further substantiating the positive effects of technology on mathematics engagement. The current study's statistically significant findings reinforce these previous studies, suggesting that technology integration is a crucial factor in creating engaging and effective mathematics learning environments. This underscores the importance of thoughtful and well-implemented technology use in classrooms to foster deeper student engagement and enhance learning outcomes in mathematics.

Problem 7. Is there a significant relationship between the perceived classroom environment and students' engagement in mathematics?

Variable	**Classroom Environment**							
	Positive and Supportive		**Engaging and stimulating**		**Orderly and organized**		**Inclusive and Respectful**	
	r-value	**p-value**	**r-value**	**p-value**	**r-value**	**p-value**	**r-value**	**p-value**
Mathematics Engagement	**.588**	**.000**	**.529**	**.000**	**.653**	**.000**	**.711**	**.000**
Overall	**.706**				**.000**			

Table 7 illustrates the correlation between different aspects of the classroom environment and students' engagement in mathematics. The data reveals strong positive correlations across all dimensions of the classroom environment with student engagement.

A Positive and Supportive classroom environment is positively correlated with students' engagement in mathematics, as indicated by an r-value of .588 and a p-value of .000. This suggests that students are more engaged in mathematics when they perceive their classroom environment as supportive and encouraging. Similarly, the Engaging and Stimulating environment shows a significant positive correlation, with an r-value of .529 and a p-value of .000. This finding indicates that a stimulating and engaging classroom setting is associated with higher levels of student engagement.

The Orderly and Organized classroom environment exhibits a very strong positive correlation with mathematics engagement, reflected by an r-value of .653 and a p-value of .000. This result implies that an organized and

orderly classroom contributes significantly to higher student engagement. Additionally, the Inclusive and Respectful classroom environment has an even stronger correlation, with an r-value of .711 and a p-value of .000. This highlights that classrooms fostering inclusivity and respect are strongly associated with increased student engagement in mathematics.

The Overall classroom environment also demonstrates a very strong positive correlation with students' engagement, with an r-value of .706 and a p-value of .000. This indicates that a positive overall classroom environment is significantly linked to higher levels of student engagement in mathematics.

The findings strongly support the critical role of the classroom environment in fostering student engagement in mathematics. The observed correlations indicate that various aspects of a positive classroom setting, including support, stimulation, organization, and inclusivity, are all significantly linked to enhanced student engagement. These results align with previous research emphasizing the importance of the classroom environment in academic success. For instance, Berlin and Cohen (2020) highlighted the impact of emotionally supportive and well-organized classroom environments on student engagement and learning outcomes. Similarly, Kusmaryono and Wijayanti (2023) emphasized that engaging and inclusive classroom experiences can promote deeper cognitive, affective, and behavioral engagement, leading to better performance in mathematics. The very strong correlations observed in this study reinforce these findings, suggesting that efforts to create supportive, organized, and inclusive classrooms are vital for maximizing student engagement in mathematics. By ensuring that classroom environments are conducive to learning, educators can significantly enhance students' motivation, participation, and ultimately, their success in mathematics.

Problem 8. Does the perceived teacher-student relationship influence students' engagement in mathematics?

Predictor	*Regression Coefficient*	*S.E*	*t-value*	*p-value*	*Remarks*
Intercept	2.17	.39	5.52	.000	Significant
X: Classroom Environment	.39	.10	3.86	.000	Significant
$R^2 = .12$	ANOVA for Regression F = 14.93, p = .000				

Table 8 illustrates the results of the regression analysis exploring whether the perceived teacher-student relationship influences students' engagement in mathematics. The intercept has a regression coefficient of 2.17, with a standard error of 0.39, indicating that when the teacher-student relationship is not considered, the baseline level of student engagement is 2.17. The t-value of 5.52 and the p-value of 0.000 confirm that this baseline level is statistically significant, meaning that it is not due to random chance.

The regression coefficient for the teacher-student relationship is 0.39, indicating that for every one-unit increase in the teacher-student relationship score, student engagement in mathematics increases by 0.39 units. The standard error of 0.10 reflects the precision of this estimate, while the t-value of 3.86 and the p-value of 0.000 show that this relationship is highly statistically significant. This suggests a meaningful and positive influence of the perceived teacher-student relationship on student engagement in mathematics.

The R^2 value of 0.12 indicates that 12% of the variance in student engagement is explained by the perceived teacher-student relationship. While this suggests that the teacher-student relationship plays a role in engagement, other factors also contribute to student engagement. The ANOVA results, with an F-statistic of 14.93 and a p-value of 0.000, confirm that the overall regression model is highly significant, reinforcing that the teacher-student relationship is a meaningful predictor of student engagement in mathematics.

In conclusion, the analysis demonstrates that a stronger teacher-student relationship positively influences student engagement in mathematics, though it accounts for only a portion of the variance, indicating that additional factors also play a role in determining student engagement levels.

Problem 9. Does the perceived classroom technology integration influence students' engagement in mathematics?

Predictor	*Regression Coefficient*	*S.E*	*t-value*	*p-value*	*Remarks*
Intercept	2.45	.35	6.91	.000	Significant
X: Classroom Environment	.33	.09	3.51	.001	Significant
R^2 = .32	ANOVA for Regression F = 12.29, p = .001				

Table 9 shows the results of the regression analysis examining whether the perceived classroom technology integration influences students' engagement in mathematics. The intercept has a regression coefficient of 2.45, with a standard error of 0.35, indicating that when classroom technology integration is not considered, the baseline level of student engagement in mathematics is 2.45. The t-value of 6.91 and the p-value of 0.000 indicate that this intercept is statistically significant, meaning that the baseline engagement level is meaningful.

The regression coefficient for classroom technology integration is 0.33, meaning that for every one-unit increase in the classroom technology integration score, student engagement in mathematics increases by 0.33 units. The standard error is 0.09, reflecting a reasonably precise estimate. The t-value of 3.51 and the p-value of 0.001 show that this relationship is statistically significant, demonstrating that classroom technology integration positively influences student engagement in mathematics.

The R^2 value of 0.32 suggests that 32% of the variance in student engagement is explained by classroom technology integration, indicating a moderate influence. The ANOVA results, with an F-statistic of 12.29 and a p-value of 0.001, confirm that the overall regression model is significant. This implies that classroom technology integration is an important predictor of student engagement in mathematics.

Overall, perceived classroom technology integration has a significant positive influence on students' engagement in mathematics, explaining a notable portion of the variance in engagement levels. Incorporating technology into the classroom can significantly enhance students' involvement in learning mathematics.

Problem 10. Does the perceived classroom environment integration influence students' engagement in mathematics?

Predictor	*Regression Coefficient*	*S.E*	*t-value*	*p-value*	*Remarks*
Intercept	.72	.29	2.44	.016	Significant
X: Classroom Environment	.78	.08	10.21	.000	Significant
R^2 = .50	ANOVA for Regression F = 104.17, p = .000				

Table 10 presents the results of a regression analysis exploring the influence of the classroom environment on student engagement in mathematics. The intercept has a regression coefficient of 0.72 with a standard error of 0.29, indicating that the baseline level of student engagement, when classroom environment factors are not considered, is 0.72. The t-value for the intercept is 2.44, with a p-value of 0.016, which is statistically significant at the 0.05 level. This means that the baseline level of student engagement is meaningful and cannot be attributed to chance.

The regression coefficient for the classroom environment is 0.78, meaning that for every one-unit increase in the classroom environment score, student engagement increases by 0.78 units. This highlights a strong, positive relationship between the classroom environment and student engagement. The standard error of 0.08 indicates a precise estimate, while the t-value of 10.21 and a p-value of 0.000 confirm that this relationship is highly statistically significant. Thus, improvements in the classroom environment are strongly associated with increases in student engagement.

The R^2 value of 0.50 shows that 50% of the variance in student engagement is explained by the classroom environment, which is a substantial portion. Additionally, the ANOVA results, with an F-statistic of 104.17 and a p-value of 0.000, suggest that the overall regression model is highly significant. This means the classroom environment is a meaningful predictor of student engagement in mathematics.

In summary, the results indicate that a positive classroom environment significantly enhances student engagement in mathematics, explaining a considerable portion of the variation in engagement levels. These findings emphasize the importance of creating a supportive and engaging classroom atmosphere to boost students' active participation in their learning.

SUMMARY OF DISCUSSIONS

The findings show that students perceive a generally high level of teacher–student relationship, particularly in terms of closeness and trust, positivity and support, and open communication. They feel their teachers are fair, caring, and encouraging, and that they can ask questions and participate in class, although there is slight room to further improve students' sense of safety in fully expressing their opinions and ideas. Classroom technology integration is likewise rated high, with students agreeing that technology is used regularly, makes learning math more engaging, and allows them to explore concepts in different ways. However, their confidence in using the technology is only moderate, indicating the need for more guidance and scaffolding in actual tech use.

Students also rate their classroom environment as consistently positive, describing it as supportive, engaging, orderly, organized, inclusive, and respectful. They report feeling a strong sense of belonging, safety, and respect, with structured routines and clear expectations that help them focus and learn. Student engagement in mathematics itself is also high, as learners express strong interest, motivation, enjoyment, and eagerness to learn new concepts, though some are less certain that they are "learning a lot," suggesting a need to make learning gains more visible and explicit.

The inferential results further show that all three key factors—teacher–student relationship, technology integration, and classroom environment—have significant positive relationships with students' engagement in mathematics. Correlation analysis reveals moderate positive links between each dimension of the teacher–student relationship and math engagement, and between technology integration and engagement. The classroom environment demonstrates the strongest correlations, particularly for inclusive, respectful, and orderly settings. Regression analyses confirm that each predictor significantly influences math engagement, with teacher–student relationship explaining 12% of the variance, technology integration 32%, and classroom environment a substantial 50%, highlighting classroom environment as the strongest single predictor of student engagement in mathematics.

RECOMMENDATIONS

Based on the findings of the study, several recommendations are proposed to enhance student engagement in mathematics. Teachers are encouraged to strengthen teacher–student relationships by fostering trust, open communication, and emotional support within the classroom. Creating a safe and inclusive learning environment where students feel comfortable asking questions, expressing ideas, and making mistakes can significantly increase their participation and motivation in mathematics. Emphasizing student-centered and interactive teaching strategies may further promote active engagement and sustained interest in learning.

In terms of instructional practice, teachers should ensure that classroom technology is meaningfully and purposefully integrated into mathematics lessons. Providing students with adequate guidance, scaffolding, and practice opportunities when using digital tools can improve their confidence and maximize the positive impact

of technology on learning. Technology use should be aligned with instructional objectives to support conceptual understanding, collaboration, and problem-solving rather than serving solely as a presentation tool.

School administrators are encouraged to support the creation of positive, organized, and inclusive classroom environments by ensuring adequate resources, well-maintained learning spaces, and supportive school policies. Professional development programs should be provided to help teachers enhance their skills in classroom management, inclusive teaching practices, and effective technology integration. Administrative support in promoting respectful classroom interactions and student well-being is essential for sustaining high levels of engagement.

Curriculum planners and education policymakers should consider integrating engagement-oriented approaches into mathematics curricula by emphasizing relational teaching, active learning strategies, and supportive classroom climates. Investments in educational technology and classroom resources should be complemented by structured training programs to ensure effective and equitable implementation.

Finally, future researchers are encouraged to explore additional variables that may influence student engagement in mathematics, such as mathematics anxiety, self-efficacy, motivation, and parental involvement. Employing mixed-methods or longitudinal research designs may provide deeper insights into how engagement develops over time and how classroom-related factors interact to shape students' learning experiences.

CONCLUSION

In conclusion, the study establishes that students' engagement in mathematics is strongly shaped by the quality of the teacher–student relationship, the extent and effectiveness of classroom technology integration, and, most powerfully, the overall classroom environment. When students experience caring, trusting relationships with their teachers, meaningful and well-supported use of technology, and a classroom that is positive, engaging, organized, inclusive, and respectful, they are more interested, motivated, and actively involved in learning mathematics. While the overall levels of all variables are high, the results also point to practical areas for improvement—such as strengthening students' confidence in using technology and ensuring every student feels fully heard and encouraged to participate. These findings underscore the importance of intentionally cultivating supportive relationships, thoughtful technology use, and a nurturing classroom climate to sustain and further enhance students' engagement and success in mathematics.

Limitations of the Study

This study employed a descriptive-correlational design, which limits the ability to establish causal relationships among the variables examined. The data were based solely on students' self-reported perceptions, which may be influenced by response bias or subjective interpretation. The sample was confined to Grades 7 to 10 students from a single secondary school, thereby limiting the generalizability of the findings to other educational contexts. In addition, the study focused only on teacher–student relationships, classroom technology integration, and classroom environment, excluding other factors that may influence student engagement in mathematics. Finally, the use of a researcher-made instrument, despite being validated and reliable, may not fully capture all dimensions of student engagement.

ACKNOWLEDGEMENT

The researcher sincerely extends heartfelt gratitude to all individuals and institutions who contributed to the successful completion of this study. Special appreciation is given to the school heads, **Mr. Arnel Superable** and **Ms. Chuchie Quiring**, for granting permission to conduct the study and for their invaluable support, cooperation, and leadership throughout the research process. Their encouragement and commitment to academic inquiry greatly contributed to the completion of this work.

The researcher also expresses deep appreciation to the teachers and students of Kalabaylabay Integrated School for their willingness to participate and for providing honest and meaningful responses essential to the study. Gratitude is likewise extended to the experts who validated the research instrument, whose insights and constructive feedback significantly improved the quality and rigor of the research.

Sincere thanks are given to colleagues and friends for their encouragement and assistance during the conduct of the study. Above all, the researcher offers profound gratitude to God for the strength, wisdom, and perseverance that made this endeavor possible. Finally, heartfelt appreciation is extended to the researcher's family for their unwavering support, patience, and inspiration throughout the completion of this research.

About the Author

Rince Cheal A. Entice, MAEd is a mathematics educator and J-1 Exchange Visitor Teacher currently teaching in North Carolina, USA. He holds a Master of Arts in Education and is a Doctor of Philosophy in Educational Management candidate at Capitol University, Philippines. He has professional experience teaching secondary mathematics in both Philippine and international classroom contexts. His academic and research interests include student engagement, teacher–student relationships, technology integration, classroom environment, and educational leadership and management. Through his teaching and scholarly work, he aims to contribute to the improvement of mathematics instruction and educational practices in diverse learning environments.

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