

# The Mediating Effect of Empathy in the Relationship Between Social Support and Academic Engagement of STEM SHS Students

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## ABSTRACT

Academically engaged students display positive attitudes in school and learning. They pay more attention in class, follow school rules better, behave well, and get improved grades. Various factors, like social support, could positively impact a student's academic engagement through emotional support, open communication, and collaboration. To better grasp this context, this study analyzed the relationship between social support and academic engagement as mediated by empathy. It utilized a non-experimental descriptive correlation design and used survey questionnaires to gather data from STEM SHS students in Davao City, all of whom were selected through convenience sampling. Analysis of results revealed that the learners had moderate to high levels of empathy, a high level of support from friends, and a generally high level of academic engagement. Results also revealed a positive correlation between social support and academic engagement, friend's support and empathy, and empathy and academic engagement. Upon closer examination, there was no sufficient evidence to support the idea of empathy as a mediating factor between social support and academic engagement. However, it is important to highlight the positive correlations between the variables, thus underlining the value of fostering a learning environment anchored on empathy, support, and engagement. Thus, it is highly suggested that academic institutions design curricula and pedagogy deeply rooted in these aspects.

**Keywords:** Empathy, social support, academic engagement, STEM, education

## INTRODUCTION

Student engagement is vital inside the classroom, more so when viewed under the lenses of empathy and social support. Students are more likely to feel a sense of belonging and connection in a place that fosters a supportive and empathic environment. By doing so, students are not only academically engaged but are also emotionally invested in their learning process. Therefore, the interrelation of empathy, social support, and academic engagement should be studied further on how they aid in creating a nurturing and effective learning environment.

Academic engagement refers to the direct efforts of students to learn, acquire skills, and desire to improve. In turn, engagement allows students to effectively participate in any academic endeavors, adapt to school culture, and maintain healthy relations with their peers (Lamborn et al., 1992, as cited in Azizmohammadi et al., 2022). Further, students with high engagement exhibit increased attentiveness and dedication to their studies, demonstrate stronger adherence to school regulations, avoid undesirable conduct, and achieve higher assessment results. In contrast, students with low academic engagement perform poorly in school, display deviant behaviors, and quit school (Amerstorfer & Frein von Münster-Kistner, 2021).

Several studies have investigated the academic engagement of STEM students. A study in the US found that

a sense of belonging is important in students' emotional and behavioral engagement (Wilson et al., 2015). Similarly, social processes (i.e., collaboration and positive student-teacher relationship) facilitated students' engagement in science learning (Henrie et al., 2015). Meanwhile, a study in Finland found that project-based science learning (PBL) enhances engagement by posing challenging situations that trigger students' interest, skills application, and collaboration (Juuti et al., 2021).

Acut (2022) revealed that PBL promotes high cognitive, emotional, and behavioral engagement among Filipino STEM SHS learners. In turn, this practice results in proficient R&D skills and high achievement. However, one obstacle to STEM education is sustaining students' engagement throughout the year (Schmidt et al., 2017). Social support can be a contributing factor to students' engagement. Students who frequently get support from their friends, teachers, and parents become actively involved in their class activities (Afable et al., 2022).

Meanwhile, a study on HEIs in Davao Region revealed that engagement had a positive correlation with students' self-efficacy. Therefore, actively engaged students have high confidence and motivation to achieve satisfactory grades. Therefore, schools must foster a learning atmosphere anchored on peer connection and support (Cubero & Villocino, 2023).

With the cited pieces of literature, it is evident that academic engagement has been a subject of research for years now. However, few published studies have explored the relationship between social support and academic engagement as mediated by empathy within the context of STEM SHS students. For this reason, the proponent wants to conduct this study.

## REVIEW OF RELATED LITERATURE

### A. Empathy

In recent years, studies have investigated moderating variables that could affect the relationship between social support and academic engagement. Empathy, for example, influences learners' emotions and behavior. In its very sense, empathy enables one to know how others feel (Smith, 2017). To expound, empathy involves understanding and experiencing the emotions of others, seeing the world from their perspective, and comprehending their emotional states (Van Lissa et al., 2017). Empathy comprises emotional and cognitive dimensions. Affective empathy involves sharing others' feelings in times of misfortune, while cognitive empathy entails understanding their thoughts and perspectives (Verhofstadt et al., 2016; Lan, 2023).

Empathy is crucial for students' interpersonal communication and social skills (Ersoy & Köşger, 2016). Likewise, empathy plays a significant role in academic behaviors and outcomes (Feshbach & Feshback, 2009, as cited in Lan, 2023). Previous research also found that teachers' overall empathy enhances students' learning and academic performance (Zhang, 2022). Further, emotionally empathetic teachers foster affective understanding and effective communication, crucial for positive teacher-student relations and collaborative academic knowledge construction (Smogorzewska, et al., 2022). Therefore, high levels of empathy contribute positively to students' overall academic engagement (Lan, 2023).

### B. Social Support

There are various sources of social support. For instance, parental support is crucial in shaping children's educational and career trajectories (Heddy & Sinatra, 2017; Niles & Harris-Bowlsbey, 2017). Positive parental support, through encouragement and guidance, plays a crucial role in fostering children's autonomy to meet educational goals (Zhang et al., 2019). Additionally, consistent parental involvement proves to be an effective factor in increasing and sustaining students' interest in STEM subjects (Gottfried et al., 2016;

Heddy & Sinatra, 2017; Rivera & Li, 2020).

Adolescent learners can also receive support from their peers. Friend support is linked to learners' overall academic success, motivation, sense of belonging within the school, and academic engagement (Kiefer et al., 2015). Hence, classrooms have high engagement when students maintain rapport with their teachers and peers (Fredricks et al., 2016). Further, it has been noted that friends have a strong link to promoting academic engagement (i.e., behavioral & emotional) when they have high educational values and provide academic support (Smith et al., 2020).

Studies have also examined the relationship between teacher support and academic engagement. Fredricks et al. (2016) believe that teachers enhance engagement by encouraging student autonomy, maintaining high expectations, delivering clear and consistent feedback, and offering diverse, stimulating, and meaningful tasks. A similar study found that there is a positive relationship between teacher support and academic engagement in high school science classrooms. Teachers boost student engagement in science by providing instrumental support, such as the use of structured lessons, suitable learning resources, and constructive feedback (Strati et al., 2017). Likewise, Taş et al. (2018) hold the view that perceived teacher support positively predicts students' task value and academic self-concept in science, leading to higher levels of engagement in the subject. Therefore, teachers must provide every support they can to maintain students' motivation and engagement during science classes.

### **C. Academic Engagement**

Academic engagement is not an entirely new field of study in education. Thus, engagement had various constructs, definitions, and scopes over the years. However, Alrashidi et al. (2016) posit that these similar themes point out engagement being a term used to describe the extent of students' effort, participation, and identification with the school and co-curricular activities. Further, engagement is multidimensional and, therefore includes different facets (e.g., affective, behavioral, and cognitive).

Affective (or emotional) engagement involves students' learning experience (liking for learning), including interests, frustrations, and boredom (Henrie et al., 2015). Similarly, affective engagement refers to the students' feelings toward academic work – happiness, anxiety, and sadness (Alrashidi et al., 2016). Liking for school is another indicator of affective engagement. Students with high affective engagement demonstrate a connection with their school, value academic achievement, and recognize support from their peers and teachers (Fredricks et al., 2004, as cited in Henrie et al., 2015; Alrashidi et al., 2016).

Meanwhile, behavioral engagement encompasses observable actions crucial for effective learning, including attendance, participation, and completion of homework (Henrie et al., 2015). Further, it is characterized by active participation in learning, positive behavior, engagement in academic tasks, and involvement in school-related activities, such as athletics and clubs (Sinatra et al., 2015). Reeve and Tseng (2011, as cited in Alrashidi et al., 2016) specifically define this engagement as students' involvement in learning activities, highlighting elements of effort, persistence, and attention. Similarly, Fredricks et al. (2004, as cited in Alrashidi et al., 2016) believe students' participation in both academic and co-curricular activities are key components of behavioral engagement.

Finally, cognitive engagement involves learners' focused effort, self-regulation, and metacognitive behaviors. Specifically, this engagement dimension encompasses students' commitment, willingness to exert effort, use of effective learning strategies, preference for challenges, self-regulation, and goal setting. Further, it includes the following tasks: clarifying questions, persistence, flexible problem-solving, and strategic learning methods (Henrie et al., 2015; Sinatra et al., 2015; Alrashidi et al., 2016).

## METHOD

In general, this study followed a quantitative research design, specifically a non-experimental descriptive utilizing correlation design. Correlational research investigates the extent of association between two or more variables (Creswell, 2005). Since correlational studies do not imply causation, this design does not establish evidence-based practices. Rather, correlational research identifies and describes the relationships and direction (positive or negative) between variables without an intervention. Therefore, a relationship between variables A and B cannot determine whether A caused B, B caused A, or if a third variable caused A and B (Cook & Cook, 2008).

One hundred and ten (110) STEM SHS students served as the respondents of this study through a non-probability sampling method. Specifically, this study employed convenience sampling – selecting respondents based on their availability.

The study allocated one week for data gathering to generate the necessary data to address this research’s questions. The researcher utilized survey questionnaires to generate data in line with the non-experimental descriptive utilizing correlation design. Each questionnaire is discussed below.

**1. Adolescent Measure of Empathy and Sympathy (AMES).** Vossen et al. (2015) developed this 12-item survey, which has three subscales: affective empathy (AE) (items 5, 7, 9, 12), cognitive empathy (CE) (items 1, 3, 8, 10), and sympathy (S) (items 2, 4, 6, 11). Participants are asked to indicate their response on a five-point Likert scale (1=Never, 2=Almost never, 3=sometimes, 4=Often, 5=Always). Table 1 presents the three subscales and their specific items, while Table 2 presents the interpretation of the 5-point Likert scale.

Table I. Adolescent Measure of Empathy and Sympathy (AMES)

Subscales	Questions
CE1	1. I can easily tell how others are feeling.
S1	2. I feel sorry for a friend who feels sad.
CE2	3. I can often understand how people are feeling even before they tell me.
S2	4. I feel sorry for someone who is treated unfairly.
AE1	5. When a friend is angry, I feel angry too.
S3	6. I am concerned for animals that are hurt.
AE2	7. When my friend is sad, I become sad too.
CE3	8. I can tell when a friend is angry even if he/she tries to hide it.
AE3	9. When a friend is scared, I feel afraid.
CE4	10. I can tell when someone acts happy when they are actually not.
S4	11. I feel concerned for other people who are sick.
AE4	12. When people around me are nervous, I become nervous too.

Table II. Likert Scale for Interpreting the Adolescent Measure of Empathy and Sympathy (AMES)

Range	Level	Interpretation
4.20-5.00	Very high	The student always practice empathy.
3.40-4.19	High	The student often practice empathy.
2.60-3.39	Moderate	The student sometimes practice empathy

1.80-2.59	Low	The student almost never practice empathy.
1.00-1.79	Very low	The student never practice empathy.

**2. Multidimensional Scale of Perceived Social Support (MSPSS).** Zimet et al. (1988) developed this 12-item survey, which has three subscales: parents (items 1, 2, 3, 4), friends (items 5, 6, 7, 8), and teachers (items 9, 10, 11, 12). Participants are asked to indicate their response on a seven-point Likert scale (1=Very Strongly Disagree, 2= Strongly Disagree, 3=Mildly Disagree, 4=Neutral, 5=Mildly Agree, 6=Strongly Agree, 7=Very Strongly Agree). In this survey, a mean scale score of 1-2.9 is considered low support, 3-5 means moderate support, and 5.1-7 is considered high support. Table 3 shows the three subscales and their specific items, while Table 4 presents the interpretation of the 7-point Likert scale.

Table III. Multidimensional Scale of Perceived Social Support (MSPSS)

Subscales	Questions
Parents	1. My parents really try to help me.
	2. I get the emotional help & support I need from my parents.
	3. I can talk about my problems with my parents.
	4. My parents are willing to help me make decisions.
Friends	5. My friends really try to help me.
	6. I can count on my friends when things go wrong.
	7. I have friends with whom I can share my joys and sorrows.
	8. I can talk about my problems with my friends.
Teachers	9. My teachers are around when I am in need.
	10. I can share my joys and sorrows with my teachers.
	11. My teachers are my real source of comfort to me.
	12. My teachers care about my feelings.

Table IV. Likert Scale for Interpreting the Multidimensional Scale of Perceived Social Support (MSPSS)

Range	Level	Interpretation
5.1-7	High	The student receives high social support.
3-5	Moderate	The student receives moderate social support.
1-2.9	Low	The student receives low social support.

In this survey, a mean scale score of 1-2.9 is considered low support, 3-5 means moderate support, and 5.1-7 is considered high support.

**3. Student Engagement in Schools Questionnaire (SESQ-ENG).** Hart et al. (2011) devised this 33-item survey that centers on the engagement indicators from the original 109-item Student Engagement in Schools Questionnaire (SESQ) by Fredricks et al. (2005). This survey has five subscales: affective engagement (liking for learning) (items 1-5); affective engagement (liking for school) (items 6-9); behavioral engagement (effort & persistence) (items 10-18); behavioral engagement (extracurricular activities) (items 19-21); and cognitive engagement (items 22-33). Participants are asked to indicate their response on a five-point Likert scale (1=Never, 2=Almost never, 3=Sometimes, 4=Often, 5=Always). Table 5 describes the five subscales and their specific items, while Table 6 presents the interpretation of the 5-point Likert scale.

Table V. Student Engagement in Schools Questionnaire (SESQ-ENG)

Subscales	Questions
Affective: Liking for Learning	1. I am very interested in learning.
	2. I think what we are learning in school is interesting.
	3. I like what I am learning in school
	4. I enjoy learning new things in class
	5. I think learning is boring.
Affective: Liking for School	6. I like my school.
	7. I am proud to be at this school.
	8. Most mornings, I look forward to going to school.
	9. I am happy to be at this school.
Behavioral: Effort & Persistence	10. I try hard to do well in school.
	11. In class, I work as hard as I can.
	12. When I'm in class, I participate in class activities.
	13. I pay attention in class.
	14. When I'm in class, I just act like I'm working.
	15. In school, I do just enough to get by.
	16. When I'm in class, my mind wanders.
	17. If I have trouble understanding a problem, I go over it again until I understand it.
Behavioral: Extracurricular Activities	18. When I run into a difficult homework problem, I keep working at it until I've solved it.
	19. I am an active participant of school activities such as sport day and school picnic.
	20. I volunteer to help with school activities such as sport day and parent day.
Cognitive	21. I take an active role in extracurricular activities in my school.
	22. When I study, I try to understand the material better by relating it to things I already know.
	23. When I study, I figure out how the information might be useful in the real world.
	24. When learning new information, I try to put the ideas in my own words.
	25. When I study, I try to connect what I am learning with my own experiences.
	26. I make up my own examples to help me understand the important concepts I learn from school.
	27. When learning things for school, I try to see how they fit together with other things I already know.
	28. When learning things for school, I often try to associate them with what I learnt in other classes about the same or similar things.

	29. I try to see the similarities and differences between things I am learning for school and things I know already.
	30. I try to understand how the things I learn in school fit together with each other.
	31. I try to match what I already know with things I am trying to learn for school.
	32. I try to think through topics and decide what I'm supposed to learn from them, rather than studying topics by just reading them over.
	33. When studying, I try to combine different pieces of information from course material in new ways.

Table VI. Likert Scale for Interpreting the Student Engagement in Schools Questionnaire (SESQ-ENG)

Range	Level	Interpretation
4.20-5.00	Very high	The student is always academically engaged.
3.40-4.19	High	The student is often academically engaged.
2.60-3.39	Moderate	The student is sometimes academically engaged.
1.80-2.59	Low	The student is almost never academically engaged.
1.00-1.79	Very low	The student is never academically engaged.

## RESULTS & DISCUSSION

### A. Level of Empathy of STEM SHS Students

The students' level of affective empathy towards different emotions was measured using a Likert scale, with 1 indicating low affective empathy and 5 indicating high affective empathy. The weighted mean values for the statements suggest that students show a moderate level of affective empathy in response to their friends' anger (2.96), sadness (3.34), and fear (2.84). However, when it comes to feeling nervous in response to others' nervousness, the level of affective empathy is high (3.45). In accordance with the present results, earlier research has shown that individuals (e.g., students) who engage in affective empathy possess the emotional capacity to feel the emotions and sentiments of other people (Verhofstadt et al., 2016; Van Lissa et al., 2017).

Table VII. Students' Level of Affective Empathy

Affective Empathy	Weighted Mean	Interpretation
When a friend is angry, I feel angry too.	2.96	Moderate
When my friend is sad, I become sad too.	3.34	Moderate
When a friend is scared, I feel afraid.	2.84	Moderate
When people around me are nervous, I become nervous too.	3.45	High
<b>Overall</b>	<b>3.15</b>	<b>Moderate</b>

Similarly, the students' level of cognitive empathy towards understanding others' emotions was measured using a Likert scale, with 1 indicating low cognitive empathy and 5 indicating high cognitive empathy. The weighted mean values for the statements suggest that students have a high level of cognitive empathy. They reported being able to easily tell how others are feeling (3.64), often understanding how people are feeling even before they are told (3.92) and being able to identify when a friend is angry even if they try to hide it

(4.26). Additionally, the students reported being able to discern when someone is acting happy while feeling something different (3.89). These results indicate that the students possess a strong ability to accurately perceive and understand the emotions of others (Verhofstadt et al., 2016; Lan, 2023).

Table VIII. Students' Level of Cognitive Empathy

Cognitive Empathy	Weighted Mean	Interpretation
I can easily tell how others are feeling.	3.64	High
I can often understand how people are feeling even before they tell me.	3.92	High
I can tell when a friend is angry even if he/she tries to hide it.	4.26	Very High
I can tell when someone acts happy when they are actually not.	3.89	High
<b>Overall</b>	<b>3.93</b>	<b>High</b>

### B. Level of Perceived Social Support of STEM SHS Students

Table 9 presents the level of social support received by the students from their parents using a Likert scale, with 1 indicating low social support and 5 indicating high social support. The weighted mean values for the statements suggest that the students receive a moderate level of social support from their parents. They reported that their parents try to help them (5.2), indicating a high level of parental effort in providing support. However, when it comes to emotional help and support, talking about problems, and parental willingness to help with decision-making, the students reported a moderate level of social support (4.62, 3.56, and 4.82, respectively). This suggests that while the parents strive to support their children, there may be room for improvement in terms of emotional support, open communication about problems, and involvement in decision-making.

As was mentioned in the literature review, several studies have reported that parents have a pivotal role in a student's academic journey. Positive and consistent parental involvement, characterized by encouragement and guidance, proves effective in enhancing and sustaining a student's interest in STEM subjects and achieving educational goals in general (Gottfried et al., 2016; Heddy & Sinatra, 2017; Niles & Harris-Bowlsbey, 2017; Zhang et al., 2019; Rivera & Li, 2020). This view is supported by Wang and Sheikh-Khalil (2014) who wrote that when parents communicate the importance of education and future plans with their children, it motivates them to engage behaviorally and emotionally in school, leading to higher achievement.

Table IX. Students' Level of Perceived Parental Support

Parents' Social Support	Weighted Mean	Interpretation
My parents really try to help me.	5.2	High
I get the emotional help & support I need from my parents.	4.62	Moderate
I can talk about my problems with my parents.	3.56	Moderate
My parents are willing to help me make decisions.	4.82	Moderate
<b>Overall</b>	<b>4.55</b>	<b>Moderate</b>

Table 10 shows the level of social support received by the students from their friends using a Likert scale, with 1 indicating low social support and 5 indicating high social support. The weighted mean values for the statements suggest that the students receive a high level of social support from their friends. They reported that their friends really try to help them (5.46) and that they can count on their friends when things go wrong (5.24), indicating that their friends are reliable sources of support. The students also reported having friends with whom they can share their joys and sorrows (5.75) and problems (5.23), indicating that they have a strong support network they can rely on for emotional help and support. Overall, the results indicate that the



students enjoy a high level of social support from their friends.

These results are consistent with Ansong et al. (2017) findings which showed peer support as the strongest predictor of student engagement. Their study further highlighted that confiding with peers provide emotional, academic, and motivational support – enabling learners to feel comfortable in school. Thus, a learner must associate himself with peers who value their education and provide academic support when needed (Kiefer et al., 2015; Fredricks et al., 2016; Smith et al., 2020).

Table X. Students’ Level of Perceived Friend Support

<b>Friends’ Social Support</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
My friends really try to help me.	5.46	High
I can count on my friends when things go wrong.	5.24	High
I have friends with whom I can share my joys and sorrows.	5.75	High
I can talk about my problems with my friends.	5.23	High
<b>Overall</b>	<b>5.42</b>	<b>High</b>

Finally, table 11 shows that the students’ perception of social support received from their teachers is moderate, as indicated by the weighted mean values for the statements. They reported that their teachers are present when they are in need (4.0), suggesting a moderate level of availability and willingness to help. However, when it comes to sharing joys and sorrows with their teachers (3.11) and viewing them as a genuine source of comfort (2.95), the level of social support received is still moderate. The students also perceived that their teachers care about their feelings (4.1), suggesting a moderate level of emotional support. Overall, the results suggest that while the students receive some level of social support from their teachers, there is room for improvement in terms of fostering stronger connections and support networks within the student-teacher relationship.

These results echoed with previous studies claiming that students who receive teacher emotional support are more engaged in school (Ruzek et al., 2016; Romano et al., 2021). Moreover, these results further underscore the positive relation between perceived teacher support and academic engagement of high school students (Fredricks et al., 2016; Strati et al., 2017; Taş et al., 2018; Romano et al., 2020). Therefore, teachers must offer students emotional support, thereby cultivating their school engagement and well-being (Romano et al., 2021).

Table XI. Students’ Level of Perceived Teacher Support

<b>Teachers’ Social Support</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
My teachers are around when I am in need.	4	Moderate
I can share my joys and sorrows with my teachers.	3.11	Moderate
My teachers are my real source of comfort to me.	2.95	Moderate
My teachers care about my feelings.	4.1	Moderate
<b>Overall</b>	<b>3.54</b>	<b>Moderate</b>

### C. Level of Academic Engagement of STEM SHS Students

The students’ level of academic affective engagement, specifically their liking for learning, is high, as indicated by the weighted mean values for the statements. They reported being very interested in learning (4.15) and finding what they are learning in school interesting (3.95), indicating a high level of engagement and enthusiasm towards their education. They also expressed liking what they are learning in school (3.85)

and enjoying the process of learning new things in class (4.14), further highlighting their positive attitude towards education. However, the statement “I think learning is boring” received a low score of 2.2, suggesting that only a small fraction of students view learning as boring. Overall, the results suggest that most students have a high level of liking for learning, finding it interesting and enjoyable. This positive attitude towards learning indicates a strong level of engagement in the educational process.

Measures of affective engagement includes students’ feelings toward academic work (Alrashidi et al., 2016). The high levels of affective engagement indicate that positive emotional response to learning prompts stronger desire to develop, master lessons, and persist in class (Henrie et al., 2015; Ben-Eliyahu et al., 2018).

Table XII. Students’ Level of Academic Affective Engagement in terms of Liking for Learning

<b>Affective: Liking for Learning</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
I am very interested in learning.	4.15	High
I think what we are learning in school is interesting.	3.95	High
I like what I am learning in school	3.85	High
I enjoy learning new things in class	4.14	High
I think learning is boring.	2.2	Low
<b>Overall</b>	<b>3.66</b>	<b>High</b>

The students’ level of academic affective engagement, specifically their liking for school, is generally high, as indicated by the weighted mean values for the statements. They reported liking their school (3.75) and feeling proud to be a part of it (3.95), indicating a positive attitude towards their school environment. Furthermore, they expressed happiness in being at their school (3.77), suggesting a favorable emotional connection to their school. However, the statement “Most mornings, I look forward to going to school” received a moderate score of 3.3, indicating that while a majority still look forward to school, there is room for improvement in terms of overall enthusiasm and anticipation. Overall, the results suggest that the students have a generally high level of liking for their school, feeling proud and happy to be a part of it. However, efforts can be made to further enhance their excitement and eagerness in attending school every day.

Schools are where students could develop holistically – equipping them with competencies to succeed in life. Hence, Lombardi et al. (2019) suggest schools to devise programs that advance a positive scholastic environment and thereby encouraging students to engage in school activities. For example, Schmidt et al. (2018) highlight the relevance of choice to encourage science engagement. By granting students the freedom to shape their own learning activities (e.g., selecting collaborators and methods), teachers empower them to engage more deeply and take ownership of their educational journey, leading to enhanced engagement. Other studies have also concluded that students with high affective engagement tend to exhibit stronger connection with their school (Fredricks et al., 2004, as cited in Henrie et al., 2015; Alrashidi et al., 2016).

Table XIII. Students’ Level of Academic Affective Engagement in terms of Liking for School

<b>Affective: Liking for School</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
I like my school.	3.75	High
I am proud to be at this school.	3.95	High
Most mornings, I look forward to going to school.	3.3	Moderate
I am happy to be at this school.	3.77	High
<b>Overall</b>	<b>3.69</b>	<b>High</b>

The students' level of academic behavioral engagement, specifically their effort and persistence in their schoolwork, is generally high, as indicated by the weighted mean values for the statements. They reported trying hard to do well in school (4.4) and working as hard as they can in class (4.19), demonstrating a strong commitment to their academic performance. They also indicated that they pay attention in class (4.05) and actively participate in class activities (3.76), indicating their engagement and involvement in the learning process. However, there are a few statements that received moderate scores. Some students admitted to occasionally acting like they're working in class (3.07) and having wandering minds (3.38). Additionally, some students mentioned doing just enough to get by (3.44).

Despite these moderate scores, overall, the results suggest that most students exhibit a high level of effort and persistence in their schoolwork. They demonstrate a strong motivation to understand and solve problems, as indicated by their willingness to go over difficult problems until they understand them (4.26) and their persistence in solving difficult homework problems (4.05). Efforts can be made to address the moderate scores, encouraging students to maintain focus and avoid complacency in their academic pursuits.

These findings confirm the idea of Gasiewski et al. (2012) who stated that behaviorally engaged students put in additional effort to understand the subject matter, exhibit strong desire to learn, and aim for outstanding performance in their academic pursuits. Further, these findings indicate that enhanced behavioral engagement can significantly contribute to students' academic success. The more involved students are in their tasks, the deeper their understanding and mastery of the subject will be (Gregory et al., 2014). Similarly, behaviorally engaged students feel more in control of their academic success and find meaning in their tasks (González et al., 2015).

Table XIV. Students' Level of Academic Behavioral Engagement in terms of Effort & Persistence

<b>Behavioral: Effort &amp; Persistence</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
I try hard to do well in school.	4.4	Very High
In class, I work as hard as I can.	4.19	High
When I'm in class, I participate in class activities.	3.76	High
I pay attention in class.	4.05	High
When I'm in class, I just act like I'm working.	3.07	Moderate
In school, I do just enough to get by.	3.44	High
When I'm in class, my mind wanders.	3.38	Moderate
If I have trouble understanding a problem, I go over it again until I understand it.	4.26	Very High
When I run into a difficult homework problem, I keep working at it until I've solved it.	4.05	High
<b>Overall</b>	<b>3.84</b>	<b>High</b>

The students' level of engagement in extracurricular activities is moderate, as indicated by the weighted mean values for the statements. They reported being an active participant in school activities such as sports day and school picnic (3.21) and taking an active role in extracurricular activities in their school (3.16). However, the results also show that they are not highly involved in volunteering to help with school activities such as sports day and parent day (2.85).

Overall, the students demonstrate a moderate level of engagement in extracurricular activities. While they actively participate in some school activities, there is room for improvement in terms of taking on additional responsibilities and volunteering to help with various school events. Encouraging students to be more

proactive in participating and volunteering in extracurricular activities can help enhance their overall engagement in science subjects (i.e., biology, chemistry, & physics) and enrichment beyond the academic realm (Adeyemo, 2010; Zhang & Tang, 2017). In the same vein, students involved in extra-curricular activities tend to show greater engagement compared to their peers who are not as involved (Wilson et al., 2014).

Table XV. Students’ Level of Academic Behavioral Engagement in terms of Extracurricular Activities

<b>Behavioral: Extracurricular Activities</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
I am an active participant of school activities such as sport day and school picnic.	3.21	Moderate
I volunteer to help with school activities such as sport day and parent day.	2.85	Moderate
I take an active role in extracurricular activities in my school.	3.16	Moderate
<b>Overall</b>	<b>3.07</b>	<b>Moderate</b>

The students’ level of cognitive engagement in their academics is high, as indicated by the weighted mean values for the statements. They demonstrate strong strategies and approaches to studying and learning. The students actively try to understand the material better by relating it to things they already know (3.99), figure out how the information might be useful in the real world (3.95), and put ideas in their own words when learning new information (4.10). They also make connections between what they are learning and their own experiences (4.01) and create their own examples to help understand important concepts (3.99).

Furthermore, the students actively try to see how the information they learn fits together with other subjects they already know (3.93) and how it relates to what they have learned before in similar topics (3.95). They also strive to understand the similarities and differences between what they are learning for school and what they already know (3.95).

Overall, the students demonstrate a high level of cognitive engagement in their academics, showing a proactive and thoughtful approach to studying and learning. They employ various strategies to deepen their understanding, make connections, and integrate different pieces of information. These behaviors indicate a strong commitment to academic success and a desire to apply their knowledge beyond the classroom.

These findings match the observations of Wara et al. (2018) who noted that highly cognitive students took pleasure in critical thinking and analyzing ideas during class discussions. Specifically, cognitively engaged students are deeply committed to their education, welcomes opportunities to learn new things or abilities, and exceeds performance standards. Further, these students have a comprehensive grasp of a subject’s learning goals, allowing them to make educated choices about what they need to learn and the best methods to learn it (Pickering, 2017).

Table XVI. Students’ Level of Academic Cognitive Engagement

<b>Cognitive</b>	<b>Weighted Mean</b>	<b>Interpretation</b>
When I study, I try to understand the material better by relating it to things I already know.	3.99	High
When I study, I figure out how the information might be useful in the real world.	3.95	High
When learning new information, I try to put the ideas in my own words.	4.1	High

When I study, I try to connect what I am learning with my own experiences.	4.01	High
I make up my own examples to help me understand the important concepts I learn from school.	3.99	High
When learning things for school, I try to see how they fit together with other things I already know.	3.93	High
When learning things for school, I often try to associate them with what I learnt in other classes about the same or similar things.	3.95	High
I try to see the similarities and differences between things I am learning for school and things I know already.	3.95	High
I try to understand how the things I learn in school fit together with each other.	3.94	High
I try to match what I already know with things I am trying to learn for school.	3.85	High
I try to think through topics and decide what I'm supposed to learn from them, rather than studying topics by just reading them over.	3.79	High
When studying, I try to combine different pieces of information from course material in new ways.	3.77	High
<b>Overall</b>	<b>3.94</b>	<b>High</b>

#### D. Relationship Between Social Support and Academic Engagement of STEM SHS Students

The results obtained from the relationship between social support and academic engagement of STEM SHS students indicate significant positive correlations for all three categories: parents' social support, friends' social support, and teachers' social support.

For parents' social support, there is a low positive correlation with academic engagement ( $r = 0.381, p < 0.001$ ). This suggests that students who receive more social support from their parents tend to have higher levels of academic engagement. It implies that parental involvement and encouragement can positively influence students' motivation and commitment to their academics.

Similarly, for friends' social support, there is a weaker positive correlation with academic engagement ( $r = 0.260, p = 0.016$ ). This means that students who perceive greater social support from their friends are more likely to be academically engaged. Having supportive friendships can create a positive and supportive learning environment, encouraging students to actively participate in their studies.

Regarding teachers' social support, there is a stronger positive correlation with academic engagement ( $r = 0.445, p < 0.001$ ). This underscores the importance of supportive teacher-student relationships. Students who feel supported by their teachers are more likely to be engaged in their academic endeavors. When teachers provide guidance, encouragement, and a positive classroom environment, students are more motivated to actively participate in their learning.

In summary, these findings agree with studies that highlight the significance of social support, be it from parents (Wang & Sheikh-Khalil, 2014; Gottfried et al., 2016; Heddy & Sinatra, 2017; Niles & Harris-Bowlsbey, 2017; Zhang et al., 2019; Rivera & Li, 2020), friends (Kiefer et al., 2015; Fredricks et al., 2016; Ansong et al., 2017; Smith et al., 2020), or teachers (Ruzek et al., 2016; Fredricks et al., 2016; Strati et al., 2017; Taş et al., 2018; Romano et al., 2020; Romano et al., 2021), in fostering academic engagement among STEM SHS students. The data also agrees with Song et al. (2015), showing that when parents, friends, and

teachers give emotional support, it helps create a safe learning space. These kinds of space leads to students setting stronger learning goals, less fear of failing, lower anxiety about tests, and better grades.

Table XVII. Relationship Between Social Support and Academic Engagement of STEM SHS Students

Social Support	Academic Engagement			
	r	p-value	Decision	Interpretation
Parents' Social Support	0.381	0.000	Reject Ho	Significant
Friends' Social Support	0.260	0.016	Reject Ho	Significant
Teachers' Social Support	0.445	0.000	Reject Ho	Significant

Note: if p-value <0.05 alpha, Reject Ho; if p-value >0.05 alpha, Accept Ho

### E. Relationship Between Social Support and Empathy of STEM SHS Students

The results obtained from the relationship between social support and empathy of STEM SHS students indicate mixed findings across the three categories: parents' social support, friends' social support, and teachers' social support.

For parents' social support, there is a very weak positive correlation with empathy ( $r = 0.149$ ,  $p = 0.121$ ). However, the p-value is not statistically significant ( $p > 0.05$ ), suggesting that this correlation may have occurred due to chance. These results indicate that there is no strong evidence to support a relationship between parents' social support and empathy among STEM SHS students.

On the other hand, for friends' social support, a significant low positive correlation with empathy is observed ( $r = 0.454$ ,  $p < 0.001$ ). This means that students who perceive greater social support from their friends are more likely to display higher levels of empathy. Having supportive friendships can contribute to developing empathy by fostering understanding, compassion, and the ability to relate to others' experiences.

Regarding teachers' social support, a weak positive correlation with empathy is found ( $r = 0.145$ ,  $p = 0.130$ ). Similarly to parents' social support, the p-value is not statistically significant ( $p > 0.05$ ). This suggests that there is no strong evidence to support a relationship between teachers' social support and empathy among STEM SHS students.

In summary, the results indicate that friends' social support has a significant positive correlation with empathy among STEM SHS students. This suggests that supportive friendships contribute to the development of empathy. Further, this study confirms the idea of Nair et al. (2024) that friends offer empathy and understanding, allowing them to share their ups and downs of their academic journey. In turn, this relationship helps with students' emotional wellbeing and fosters a community outside the classroom. However, there is no strong evidence to support a relationship between parents' social support or teachers' social support and empathy in this context.

Table XVIII. Relationship Between Social Support and Empathy of STEM SHS Students

Social Support	Empathy			
	r	p-value	Decision	Interpretation
Parents' Social Support	0.149	0.121	Accept Ho	Not Significant
Friends' Social Support	0.454	0.000	Reject Ho	Significant
Teachers' Social Support	0.145	0.130	Accept Ho	Not Significant

Note: if p-value <0.05 alpha, Reject Ho; if p-value >0.05 alpha, Accept Ho

### F. Relationship Between Empathy and Academic Engagement of STEM SHS Students

The results indicate that there is a significant positive relationship between affective empathy and academic engagement among STEM SHS students, with a correlation coefficient (r) of 0.207 and a p-value of 0.030. This means that students who possess higher levels of affective empathy are more likely to be academically engaged.

Similarly, there is also a significant positive relationship between cognitive empathy and academic engagement among STEM SHS students, with a correlation coefficient (r) of 0.242 and a p-value of 0.011. In this case, students who have a higher level of cognitive empathy are more likely to be academically engaged. This suggests that the ability to understand and consider different perspectives and viewpoints may enhance students' motivation and drive to succeed academically.

Overall, these findings highlight the importance of empathy, both affective and cognitive, in the academic engagement of STEM SHS students. These results accord with previous observations of Tikkanen et al. (2022) on the positive relations of empathy and student engagement. They suggested that highly empathic students are more likely to pick up on their classmates' feelings about learning, both good and bad. In turn, this can affect how well they do in their own studies. These results also seem to be consistent with Fathi et al. (2024) who found significant positive correlations between empathy and academic buoyancy. This suggests that empathy contributes to students' resilience in academic settings thereby enhancing their overall engagement and well-being. Therefore, fostering empathy may help students develop a stronger sense of connectedness with their academic work, improving their overall learning experience and achievement.

Table XIX. Relationship Between Empathy and Academic Engagement of STEM SHS Students

Empathy	Academic Engagement			
	r	p-value	Decision	Interpretation
Affective Empathy	0.207	0.030	Reject Ho	Significant
Cognitive Empathy	0.242	0.011	Reject Ho	Significant

### G. Mediating Effect of Empathy to the Relationship Between Social Support and Academic Engagement of STEM SHS Students

The direct effect of social support on academic engagement was estimated to be 0.1940, with a standard error (SE) of 0.0392. The Z-score of 4.95 indicates that this direct effect is statistically significant (p < .001). This means that social support has a significant positive impact on academic engagement among the participants, independent of empathy.

The indirect effect of social support on academic engagement through empathy was estimated to be 0.0164, with a standard error of 0.0131 and a Z-score of 1.25. The p-value of 0.211 suggests that this indirect effect is not statistically significant. This implies that empathy does not mediate the relationship between social support and academic engagement in this study.

The total effect of social support on academic engagement, which includes both the direct and indirect effects, was estimated to be 0.2104 with a standard error of 0.0375. The Z-score of 5.61 indicates that the total effect is statistically significant (p < .001). This suggests that social support has a substantial positive effect on academic engagement, regardless of empathy's mediating role.

The study, using correlational research design, reveals a positive relationship between social support and student engagement of STEM SHS learners. However, it does not establish empathy as a mediating factor. This finding further underscores the non-causal nature of correlational research. By nature, correlational studies describe associations without implying causation, leaving room for unmeasured variables to influence observed relationships (Cresswell, 2005; Cook & Cook, 2008). Hence, the study remains within the bounds of correlational research and refrains from asserting direct causality.

Table XX. Mediating Effect of Empathy to the Relationship Between Social Support and Academic Engagement

Effect	Estimate	SE	Z	p
Indirect	0.0164	0.0131	1.25	0.211
Direct	0.1940	0.0392	4.95	< .001
Total	0.2104	0.0375	5.61	< .001

## CONCLUSIONS AND RECOMMENDATIONS

This paper, exploring empathy’s role in social support and academic engagement among STEM SHS students, underscores the importance of a supportive and empathic environment in a learner’s academic pursuits. The learners’ moderate and high levels of affective and cognitive empathy suggest they can understand and share a friend’s emotional experiences and possess a strong ability to recognize the emotions of others.

The learners’ levels of perceived support were analyzed in terms of parental, friend, and teacher support. It can be noted that the mean values from both parental and teacher support show moderate support. These values suggest that parents must improve in providing emotional support, establishing open communication, and stronger involvement in decision-making. Teachers, on the other hand, must improve in terms of fostering a healthier rapport and supportive network with their learners.

Meanwhile, the learners’ level of academic engagement was analyzed in terms of affective, behavioral, and cognitive dimensions. The high affective engagement suggests that most learners like learning and are eager to attend school. Data from the second dimension shows moderate to high levels of behavioral engagement. This result implies that while learners exhibit strong effort and persistence in their schoolwork, they must be more proactive by joining extracurricular activities. Finally, the learners exhibit a high level of cognitive engagement, showing they apply effective learning strategies and approaches.

This paper also analyzed the relationship between social support and academic engagement of STEM SHS students. The results show a positive correlation between social support and academic engagement of learners. Specifically, the paper found that a friend’s social support had the strongest positive correlation with empathy.

Regarding the relationship between empathy and academic engagement, this paper identified a positive correlation between the variables. This result emphasizes the key role of empathy in the overall academic engagement of learners. Lastly, this paper shows no strong evidence to support empathy as a mediating factor in the relationship between social support and academic engagement. However, it is important to highlight the significant positive impact of a strong support system on learners’ academic engagement.

Overall, results from this study offer vital recommendations in the education field. Academic institutions



should capitalize on the significance of social support in every learner's academic endeavors. This serves as a promising starting point for nurturing a positive school culture firmly grounded on social support. Further, this study can be a good reference in designing curriculum and pedagogy that promotes emotional support, open communication, and collaboration. Finally, further research may be conducted to explore potential interventions to enhance the empathy skills of learners thereby potentially amplifying its mediating effect on social support and academic engagement.

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