Student-Teacher Relationship as a Mediator for Attitudes Toward Science and Self-Regulated Learning

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ABSTRACT

This study explored how student-teacher relationships influence the connection between students' attitudes toward science and their self-regulated learning (SRL) behaviors in Maramag II District, Bukidnon, Philippines. The research involved 363 junior high school students who completed surveys measuring their attitudes toward science, SRL, and the quality of their relationships with teachers. The findings showed that students generally had a positive attitude toward science, particularly in motivation and perceived usefulness, and were engaged in strong SRL behaviors. However, their interest in pursuing science-related careers was more moderate. The study also found that positive student-teacher relationships played a key role in strengthening the link between attitudes toward science and self-regulated learning. The path analysis revealed that teacher support helped improve students' ability to manage their learning, especially in science. These results emphasize the importance of fostering supportive teacher-student relationships to not only boost students' interest in science but also enhance their learning behaviors. This study contributes to the field of educational institutions by highlighting the critical role of teacher support in improving students' academic success, particularly in science education.

Keywords: self-regulated learning, student-teacher relationship, attitudes toward science, academic achievement, mediation, Philippines.

INTRODUCTION

Self-regulated learning (SRL) includes strategies that can improve academic performance, especially in science. However, many students struggle to use SRL techniques effectively. For example, Van Alten et al. (2020) found that students often lack basic skills like time management, and more advanced strategies such as goal-setting and staying focused usually need extra support and guidance, as Ärlevä et al. (2019) observed. These difficulties can lead to less engagement and lower achievement, particularly in challenging subjects like science. Studies show that students with positive attitudes toward science are more likely to use SRL strategies, which help them stay persistent and focused during tough tasks, as noted by Kitsantas et al. (2020) and Zimmerman and Schunk (2020).

The importance of SRL has grown significantly in educational discussions, particularly regarding its role in fostering academic achievement and lifelong learning (Zimmerman & Schunk, 2020). By integrating metacognitive, motivational, and behavioral techniques, SRL empowers students to manage their learning processes effectively, especially in challenging areas like science (Järvelä et al., 2019). Studies have shown that students with strong SRL abilities are better equipped with problem-solving skills, persistence, and adaptability, which are crucial for overcoming obstacles and achieving their educational goals (Panadero, 2020). In science education, SRL is particularly essential for comprehending abstract concepts and solving complex problems, thereby promoting greater commitment and resilience (Veenman, 2020). Moreover, SRL aligns with current trends in learner-focused education, enabling students to set goals, track progress, and adjust their strategies to foster deep learning and success (Yeh et al., 2021).

Furthermore, research underscores the importance of teacher-student relationships in shaping SRL behaviors and academic outcomes. Positive teacher interactions, as described by Ang et al. (2020) and Zinn et al. (2022), are

linked to increased student motivation and engagement, which are vital for the successful application of SRL strategies. Teacher support not only fosters a positive attitude towards science but also encourages students to embrace self-regulation techniques (Zhang et al., 2020). However, negative student-teacher relationships can hinder SRL by lowering student confidence and motivation, particularly in subjects like science where perceived difficulty can reduce student involvement. Instructors who foster supportive and encouraging relationships create an environment where students feel more confident in adopting SRL strategies, ultimately improving their academic outcomes and resilience (Pintrich, 2000; Schunk & Zimmerman, 2021). Thus, teacher-student dynamics play a crucial role in shaping students' attitudes and their ability to self-regulate their learning effectively.

Albert Bandura's Social Cognitive Theory (SCT) provides a valuable framework for understanding the relationship between attitudes, interactions, and self-regulated learning (SRL). SCT emphasizes the dynamic interplay between personal perspectives, behaviors, and environmental experiences, suggesting that positive student-teacher relationships can enhance students' self-efficacy, motivation, and academic success. A supportive classroom climate strengthens the influence of attitudes on learning behaviors, with students perceiving caring teachers as more confident and likely to adopt self-regulated study habits.

This aligns with the principles of Self-Determination Theory, which highlights how constructive interactions satisfy intrinsic motivation needs. Recent research supports SCT's view, showing that teacher support positively impacts students' attitudes toward science and enhances their SRL, thereby reinforcing the importance of examining the mediating role of teacher-student relationships in fostering both motivation and self-regulation.

This study uses Bandura's Social Cognitive Theory (1986) to examine how personal views, surroundings, and actions work together in self-regulated learning (SRL). Research shows that when teachers support students, it helps them feel more confident and encourages regular use of SRL strategies (Yeh et al., 2021; Li et al., 2020). The theory points out that having a positive attitude toward science and strong teacher support can build motivation, help students set goals, and develop resilience, all of which improve SRL. The relationship between students and teachers also shapes how attitudes affect SRL. Factors like satisfaction, practical help, and support have a strong impact on students' academic and emotional well-being (Ang et al., 2020). When teachers and students have positive interactions, students feel they belong and are more likely to adopt SRL practices. This shows how important it is to build supportive teacher-student relationships to create an environment where students can participate, explore, and use SRL strategies successfully.

This study aims to investigate the mediating role of student-teacher relationships in the connection between students' attitudes toward Science and their self-regulated learning (SRL). The specific objectives include: (1) measuring students' attitudes toward Science in terms of attitude, motivation, utility, self-efficacy, and norms; (2) assessing students' SRL across the stages of before, during, and after study, along with their motivation; (3) evaluating the levels of student-teacher relationships based on satisfaction, help, and conflict; (4) exploring the relationship between students' attitudes toward Science and their SRL; and (5) determining the significance of the student-teacher relationship as a mediator in the connection between students' attitudes and their SRL.

This research is important because it explores how student-teacher relationships affect students' attitudes toward science and their ability to manage their own learning. By looking at these relationships, the study sheds light on what helps or hinders students as they learn on their own, especially in science classes. The results will add to theories like Social Cognitive Theory and Attachment Theory, helping us understand how strong teacher-student connections can shape learning habits. These findings matter for society, too. Encouraging students to enjoy science and feel motivated can inspire them to choose careers in STEM, which is vital for solving big issues like climate change and healthcare. Building better student-teacher relationships also supports students' mental health and helps them become more resilient, setting them up for success in school and beyond. This study supports Sustainable Development Goal 4 by encouraging students to take charge of their learning and become active, capable citizens. It also lays the groundwork for more research on how these relationships affect self-directed learning.

MATERIAL AND METHOD

Study design and participants: a correlational design approach was used. Stratified random sampling was used to guarantee a representative sample of students from various grade levels and sections within the Maramag II district. As per the literature on sample size standards for social science investigations, a sample of 363 members is usually adequate to identify moderate effect sizes with suitable statistical power. This sample size is viewed as optimal for examining connections between variables and confirms that the discoveries are generalizable to the more extensive population of junior high school students.

Instruments: The Attitudes Toward Science instrument, developed by Aydeniz and Kotowski (2014), measures students' motivation, perceived utility, self-efficacy, normative beliefs, and intentions to pursue science, using a five-point Likert scale where higher scores reflect more positive attitudes. The Student-Teacher Relationship Inventory (S-TSRI), developed by Ang, Ong, and Li (2020), assesses factors such as care, trust, respect, conflict, and belonging within student-teacher interactions, also employing a five-point Likert scale to gauge the strength of the relationship, with higher scores indicating better relational dynamics. Self-regulated learning was evaluated through a questionnaire focusing on goal-setting, time management, self-monitoring, and independent study strategies, aiming to capture students' ability to manage their learning effectively.

Data Analysis and collection: During the initial testing phase, 30 students from outside the researchers' school were enlisted to evaluate the instruments' clarity and consistency, with a Cronbach's alpha of 0.813 indicating strong internal reliability and confirming their suitability for the core study.

A comprehensive ethical framework was implemented throughout the study to ensure transparency, voluntary participation, and anonymity. Informed consent was obtained from both students and their parents or guardians, outlining the research's aims, methods, and potential benefits, with participants informed that their involvement was voluntary and would not affect their academic standing. The study adhered to the principle of non-maleficence, prioritizing participants' psychological security and well-being.

RESULT AND DISCUSSION

Level of Attitudes Towards Science

The outcomes indicate that the pupils generally exhibit a positive outlook on science, with an overall average score of 3.62. Among the various aspects assessed, motivation towards science received the highest average (M = 4.02), followed by the perceived usefulness of Science (M = 3.89). The lowest average, yet still considered high, was seen in the intention to pursue science-related activities (M = 3.33). These discoveries suggest that while students show a strong interest in and appreciation for the relevance of science, a relatively smaller proportion express a strong inclination to pursue science-related occupations or activities.

This finding suggests that science educators have effectively inspired students' interest and participation in the subject. To build on this achievement, educators could incorporate more exercises that interface classroom content with potential science careers. Ventures, such as task-based learning, vocational talks, and science-related activities, can help reinforce students' goals to pursue Science beyond their school years.

Level of Self-Regulated learning

The results in Table 2 show that students generally exhibit a high level of self-managed learning, with a mean score of 3.76. Among the four parts, inspiration stood separated with the most astounding rating (M = 3.90), trailed closely by after-study systems (M = 3.77). Both before-study and during-study systems received a similar score (M = 3.68), indicating that students consistently apply guideline procedures throughout the learning process.

The investigation proposes that students are, in a general sense, prepared, critical, and inspired students. Teachers can enhance this quality by engaging in reflective practices, encouraging objective setting, and providing opportunities for independent research. Structured direction can also enhance students' ability to monitor and manage their learning process effectively.

Level of Student-Teacher Relationship

Table 3 revealed that the ratings of overall relationships were moderate, with a mean score of 3.39. Satisfaction with interactions received the highest mark (M = 3.91), followed by perceptions of assistance provided (M = 3.47). However, reports of tension were more modest (M = 2.79). These outcomes imply that while most pupils feel supported and pleased by their instructors, some may encounter a reasonable degree of unease or discomfort.

These conclusions suggest that while most students value and appreciate their teachers, interpersonal obstacles may persist that impact the quality of connections between students and teachers. Educators ought to continuously cultivate caring and respectful bonds with pupils while also addressing sources of friction through candid communication, empathy, and strategies for positive management of classrooms.

Significance of the Relationship between Attitudes Towards Science and Self-regulated Learning

Table 4 examines the interplay between students' perspectives of science and their self-regulated studying at different points in the process: in advance of, during, and following research. The results reveal meaningful positive links between attitudes toward science and elements of SRL, like motivation, usefulness, self-efficacy, normative beliefs, and the intention to pursue science-related activities, at all three moments. Notably, the correlations seen overall, with a coefficient p-value of 0.000, demonstrate that the relationships between the variables are significant across the entire period of study: Beforehand, During, and After. It suggests that students with more optimistic attitudes toward science may be key to enhancing pupils' SRL, essential for effective science learning. Given this, teachers might want to incorporate techniques that elevate students' attitudes, like real-world applications of science and student-centered methodologies. These approaches can help inspire autonomous studying habits and promote more engaged participation in science education.

Significance of the Relationship between Attitude towards Science and Student-Teacher Relationship

Table 5 examines the correlations between students' perspectives of Science and their views of the student-instructor bond, focusing on fulfillment, aid, and conflict at various phases. The results demonstrate noteworthy good correlations between students' perspectives and the two measures of fulfillment and believed help, while noteworthy negative correlations were seen with conflict. The study suggests that students who hold positive views of Science tend to perceive their relationships with instructors more favorably, seeing them as more supportive and less conflictual.

The most grounded correlations were discovered with fulfillment (.567) and perceived help (.501), demonstrating that students who have positive perspectives toward Science are increasingly inclined to experience positive interactions with their instructors. These connections, subsequently, can create a more supportive and beneficial learning environment. All in all, these outcomes emphasize the significance of cultivating positive perspectives toward Science, as they not only enhance students' engagement with the subject but also contribute to more beneficial, supportive student-teacher relationships that can foster a superior learning experience in science education.

Significance of the Relationship between Student-teacher Relationship and Self-regulated Learning

Table 6 investigates the association linking student-teacher relationship quality and students' self-regulated learning at three different stages. The outcomes demonstrate substantial positive correlations, specifically with satisfaction and perceived help, across all time points, implying that supportive teacher relationships are strongly connected to higher self-regulated learning levels. The correlations are strongest during and after the study periods, highlighting the importance of ongoing relational backing in fostering autonomous studying behaviors. In contrast, conflict displays weaker or insignificant correlations, indicating that while conflict may impact self-regulated learning, positive relational facets are more critical.

These insights suggest that cultivating positive student-teacher relationships can significantly impact students' self-regulation in scientific learning. As recent exploration has shown (e.g., Smith & Patel, 2022; Garcia et al., 2023), capable teacher support enhances students' motivation, confidence, and ability to engage in autonomous studying strategies. Therefore, teacher training programs should prioritize relational skills and approaches that construct trust and support, as these are key to fostering self-regulated learning and academic success in science.

Significance of the influence of attitude towards Science on Self-regulated learning as mediated by the student-teacher Relationship

Table 7 shows attitude towards Science significantly anticipated self-regulation on its own (B = 0.900, β =.732, $p < 0.001$). When the student-teacher bond entered as a mediator, attitude still markedly anticipated the mediator (Step 2: B = 0.643, β = .547, $p < 0.001$) and the mediator significantly foresaw self-regulation (Step 3: B = 0.232, β = .221, $p < 0.001$). In the end, with both in the model, attitude's direct impact reduced to B = 0.751, β =.611, $p < 0.01$, signifying partial mediation through the student-teacher bond.

While a student's attitude towards Science notably influences their capability to self-manage learning, the quality of their bond with an educator also critically molds this dynamic. Teachers must recognize that constructing robust, respectful relations with pupils not only improves the classroom environment but also has concrete scholarly benefits, like enhancing students' ability to oversee learning.

The Influence of Student teacher Relationship on student attitude toward science and self-regulated learning

The overall mediation model, supported by regression paths and the Sobel test, confirms that the student-teacher relationship partially mediates the effect of attitude toward Science on self-regulated learning. The total effect (B = 0.900) decreased to B = 0.751 when the mediator was added, with the indirect path being significant (a = 0.643, b = 0.232). The ratio of indirect to direct effect is 0.198, and about 16.53% of the total effect is explained by the mediation.

This research accentuates a balanced pedagogy in science education whereby both relational context and cognitive involvement synergistically promote achievement. Educators ought to cultivate an environment where students feel respected, valued, and secure. Such climates nurture self-guided learning, critical for prospering in inquiry-driven fields like Science.

Finally, the outcomes of the research align strongly with the theoretical framework of the study, particularly Social Cognitive Theory (SCT) and Self-Determination Theory (SDT). The findings support the triadic reciprocal model of SCT, where personal factors (attitudes), behavioral outcomes (self-regulated learning), and environmental influences (teacher assistance) interact to shape learning behaviors. In this research, the positive attitude students have toward Science, combined with the supportive role of instructors, facilitated the use of more effective self-regulated learning strategies. Additionally, the results resonate with SDT's emphasis on autonomy, competence, and relatedness, particularly the role of teacher-student bonds in fostering intrinsic motivation and self-regulation. Overall, this study's results not only validate the theoretical models but also underscore the importance of both cognitive and relational elements in enhancing students' learning experiences and consequences.

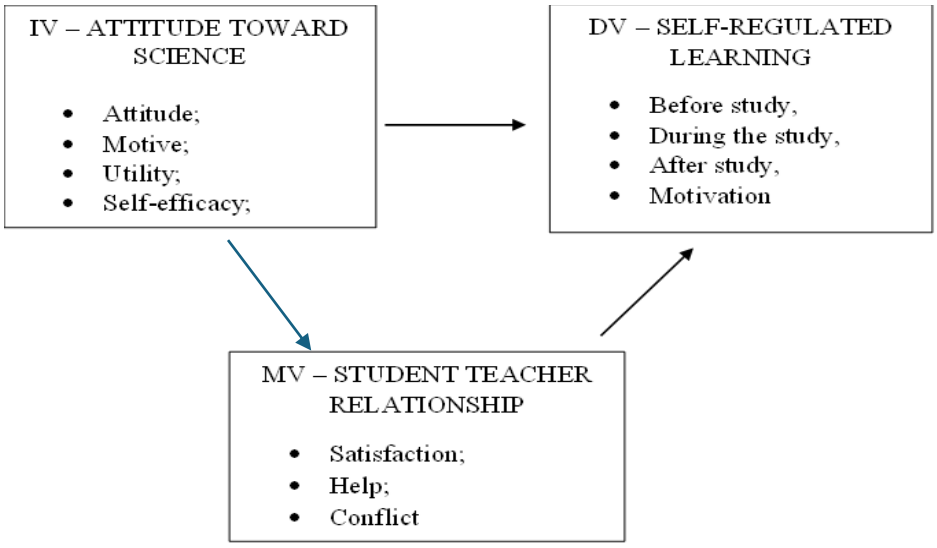

Figure 1. Conceptual Framework

Table 1

Level of Attitude towards Science

Indicators	SD	Mean	Descriptive Level
Attitude toward Science	0.71	3.60	High
Motivation toward Science	0.75	4.02	High
Utility of Science	0.72	3.89	High
Self-efficacy in Science Learning	0.68	3.44	High
Normative Beliefs about Science Involvement	0.78	3.48	High
Intension to Pursue Science Related Activities	0.88	3.33	High
Overall	**0.53**	**3.62**	**High**

Table 2

Level of Self-regulated Learning

Indicators	SD	Mean	Descriptive Level
Before Study	0.89	3.68	High
During Study	0.66	3.68	High
After Study	0.85	3.77	High
Motivation	0.78	3.90	High
Overall	**0.65**	**3.76**	**High**

Table 3

Level of Student-teacher Relationship

Indicators	SD	Mean	Descriptive Level
Satisfaction	0.79	3.91	High
Help	0.84	3.47	High
Conflict	1.06	2.79	Moderate
Overall	**0.62**	**3.39**	**Moderate**

Table 4

Significance of the Relationship between Attitude towards Science and Self-regulated Learning

Attitude towards Science	Self-regulated Learning				
	Before Study	During Study	After Study	Motivation	**Overall**
Attitude toward Science	.301** .000	.374** .000	.306** .000	.389** .000	**.414** .000**
Motivation toward Science	.422** .000	.536** .000	.481** .000	.513** .000	**.590** .000**
Utility of Science	.416** .000	.571** .000	.506** .000	.508** .000	**.604** .000**
Self-efficacy in Science Learning	.383** .000	.487** .000	.393** .000	.369** .000	**.493** .000**
Normative Beliefs about Science Involvement	.517** .000	.512** .000	.468** .000	.453** .000	**.595** .000**
Intension to Pursue Science Related Activities	.323** .000	.368** .000	.352** .000	.252** .000	**.394** .000**
Overall	**.561** .000**	**.673** .000**	**.595** .000**	**.585** .000**	**.732** .000**

Table 5

Significance of the Relationship between Attitude towards Science and Student-teacher Relationship

Attitude towards Science	Student-teacher Relationship			
	Satisfaction	Help	Conflict	**Overall**
Attitude toward Science	.337** .000	.262** .000	-.019 .714	**.251** .000**
Motivation toward Science	.529** .000	.302** .000	-.082 .121	**.314** .000**
Utility of Science	.544** .000	.289** .000	-.023 .660	**.348** .000**
Self-efficacy in Science Learning	.363** .000	.419** .000	.276** .000	**.500** .000**
Normative Beliefs about Science	.398** .000	.483** .000	.217** .000	**.511** .000**
Involvement Intension to Pursue Science Related Activities	.240** .000	.346** .000	.207** .000	**.376** .000**
Overall	**.567** .000**	**.501** .000**	**.141** .007**	**.547** .000**

Table 6

Significance of the Relationship between Student-teacher Relationship and Self-regulated Learning

Student-teacher Relationship	Self-regulated Learning				
	Before Study	During Study	After Study	Motivation	**Overall**
Satisfaction	.474** .000	.571** .000	.549** .000	.607** .000	**.667** .000**
Help	.350** .000	.444** .000	.409** .000	.384** .000	**.480** .000**
Conflict	.108* .040	.095 .072	.076 .147	.037 .479	**.096 .066**
Overall	**.420** .000**	**.497** .000**	**.461** .000**	**.452** .000**	**.555** .000**

Table 7

Significance of the influence of attitude towards Science on Self-regulated learning as mediated by the student-teacher relationship

Step	Path	B	S.E.	β
1	c	.900	.044	.732***
2	a	.643	.052	.547***
3	b	.232	.043	.221***
4	c'	.751	.051	.611**

* $p<0.05$, ** $p<0.01$, *** $p=0.000$

CONCLUSION

This study explored the relationship between junior high school students' attitudes toward science, self-regulated learning strategies, and relationships with teachers in the Maramag II District, Philippines. Generally, students held positively attitudes toward science, with high motivation (M = 4.02) and perceptions of relevance (M = 3.89). However, while interested, students' plans to participate in science-related activities in the future remained

moderately positive (M = 3.33), indicating a disconnect between enjoyment of the subject presently and career aims later. Regarding self-regulated learning, engagement scored strongly, with motivation (M = 3.90) and post-class study tactics (M = 3.77) rated highest. The result suggests students were motivated and applied reflective practices. Additionally, rapport with educators was deemed generally positive (M = 3.39), with high satisfaction (M = 3.91) and assistance received (M = 3.47), though some conflict was present at a moderate level (M = 2.79). Collectively, these findings underscore the value of nurturing a supportive academic environment and addressing potential conflicts to optimize students' experiences.

Consent (Where Ever Applicable)

All authors declare that written informed consent was obtained from the parents (or guardian) for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial Office, Chief Editor, and Editorial Board members of the journal.

Ethical Approval (Where Ever Applicable)

The committee thoroughly assessed the investigation's ethical aspects and issued an official UMERC Compliance Certificate, guaranteeing conclusively that the research complied with all university guidelines regarding ethical research. With the issuance of UMERC Protocol No. 2025-075, the study was conducted under strict ethical supervision, ensuring scrupulously that participants' rights were respected and that the entire data collection process was secure, confidential, and transparent.

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