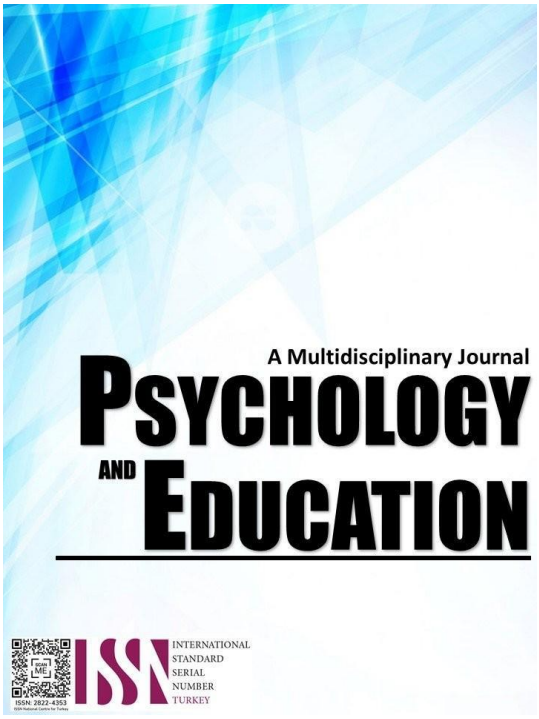
CLASSROOM MANAGEMENT TECHNIQUES, MOTIVATION, AND STUDENTS' ACADEMIC PERFORMANCE IN SCIENCE



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Research Article

Classroom Management Techniques, Motivation, and Students' Academic Performance in Science

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Abstract

The shift to online education has transformed science learning by enhancing technological skills and critical thinking, but it also introduced distractions that affect student focus and engagement. This study examined the implementation of enhanced classroom management techniques, student motivation, and their effects on academic performance in science. Using a causal-predictive research design, the study focused on Grade 12 students selected through the Cochran procedure and proportionate stratified random sampling. Data were analyzed using mean, standard deviation, Pearson Product-Moment Correlation, and multiple regression, with a significance threshold set at 0.075. Findings revealed that enhanced classroom management techniques were highly implemented across four key domains: positive reinforcement, active engagement, visuals and multimedia application, and time management practices. Students demonstrated a high level of both intrinsic and extrinsic motivation toward science and performed at a proficient level in the subject. A statistically significant, albeit small, positive correlation was found between the use of positive reinforcement and students' academic performance, which led to the rejection of the null hypothesis in that specific aspect. However, no other classroom management or motivation variable was found to significantly influence academic performance when considered individually or in combination, resulting in the acceptance of the overall null hypothesis. These findings suggest that while positive reinforcement may contribute modestly to improved academic outcomes, other unexplored factors could be more influential in determining students' performance in science. The study underscores the complexity of academic achievement and highlights the limited predictive power of the variables investigated. The results hold practical implications for educators and policymakers. Emphasis should be placed on active learning strategies and classroom practices that foster student engagement and motivation. The findings also support the need for a more holistic approach to educational improvement—one that integrates classroom management with broader psychosocial and instructional factors. Education authorities are encouraged to pursue policies that promote inclusive, engaging, and student-centered learning environments to support both academic success and personal development.

Keywords: *causal-predictive design, enhanced classroom management techniques implementation, extrinsic and intrinsic motivation, science academic performance*

Introduction

The shift to online education has significantly transformed the way science is taught and learned, fostering the development of technological skills, critical thinking, and creativity among students. However, it also presents challenges—most notably, distractions from digital devices such as cell phones—which can hinder students' focus, engagement, and overall academic performance.

In the Philippine context, the persistent underperformance in basic education remains a pressing concern. Reports indicate that Filipino high school students continue to score below average in international assessments, particularly in reading and science, with an average science score of 50.25% as reported by PISA (2022). This educational stagnation is further compounded by the learning disruptions caused by the COVID-19 pandemic and prolonged school closures.

To better understand and address these challenges, this study is anchored in two theoretical frameworks: Skinner's Classroom Management Theory and the Self-Determination Theory (SDT). Skinner's theory emphasizes the use of positive reinforcement, structured routines, and engaging instructional strategies to shape desirable student behaviors and foster a productive classroom environment. On the other hand, SDT highlights the importance of fulfilling students' psychological needs for autonomy, competence, and relatedness to enhance motivation and academic performance. It differentiates between intrinsic motivation, which stems from genuine interest, and extrinsic motivation, which is driven by external rewards or pressures.

Grounded in these theories, this study aims to assess the level of implementation of enhanced classroom management techniques, examine students' motivation toward science, evaluate their academic performance, and determine the relationships among these variables. Additionally, it seeks to identify which of these factors, individually or collectively, significantly influence students' academic performance in science.

Research Questions

The study aimed to identify the factors that significantly impact students' academic performance in science. More specifically, this research sought to address the following questions:

1. What is the level of enhanced classroom management techniques implementation in terms of:
    1.1 positive reinforcement;

1.2 active engagement;
1.3 visuals and multimedia application; and
1.4 time management and organization practices?

2. How motivated are the students to the science subject in terms of:
   2.1 intrinsic; and
   2.2 extrinsic?
3. What is the level of students' academic performance in science?
4. Is there a significant relationship between students' academic performance and:
   4.1 classroom management techniques implementation; and
   4.2 motivation towards science?
5. Which variables, singly or in combination, significantly influence students' academic performance in science?

Literature Review

Enhanced Classroom Management Technique Implementation

Aransiola (2020) found that reinforcement has a strong positive influence on the academic performance of business studies students. The study's results indicate that using verbal instructions as a classroom management method significantly enhances the academic achievements of business studies students in junior secondary schools. When teachers provide clear directions on tasks and how to complete them, students tend to perform better in their studies. This suggests that incorporating verbal instructions in the teaching process can improve business studies students' academic outcomes.

Bruno and Tippet (2022) revealed that specialized training, established rules and procedures, positive rewards, and continued parental support were resources to promote positive reinforcement. This is supported by research highlighting the importance of creating a sense of belonging and fostering relational trust between teachers and students. By doing so, teachers can cultivate a nurturing environment that empowers students to take ownership of their learning. It can be achieved through joyful learning techniques, such as peer discussions and decision-making, which give students greater control over their education. By adopting these approaches, teachers can build strong relationships with their students and create a safe and inviting classroom setting that fosters academic success and personal growth.

A study by Stueber (2019) suggested that when teachers provide tools that redirect behavior and empower students with self-control and self-regulation, it improves classroom dynamics and strengthens the bonds between students and teachers. This finding highlighted the importance of incorporating active engagement strategies into teaching practices, as it enhances student learning and promotes a positive and supportive learning environment.

According to Sultana and Shakur (2022), effective time management is associated with greater academic performance and lower anxiety levels in students. Many students struggle to balance their studies and day-to-day lives, and males have greater time management skills than females. A student's ability to manage their time well is crucial to their performance in scientific classes. Students who effectively manage their study time typically achieve higher academic results and feel less anxious. For many students, finding a balance between their daily and academic obligations can be difficult. Learning and using efficient time management techniques as a student can have a significant positive impact on both overall well-being and academic achievement.

Teacher has effectively modeled and taught these essential skills, which are crucial for students to succeed in science and other subjects. As a result, students were likely to develop good habits and strategies for managing their time and staying organized, which can translate to improved academic performance and overall educational success. Researchers in higher education have identified time management as an important factor in student academic performance and retention (Ahmed et al., 2019). The researcher identified staff and student needs and appropriate time management components to address those needs (Breternitz Rich, 2022).

According to Sultana and Shakur (2022), students who are proficient in time management typically attain better academic results and experience reduced anxiety levels. However, numerous students find it challenging to balance their daily responsibilities with their academic commitments, and it has been noted that males often display weaker time management skills compared to females. The consequences of poor time management can be severe, leading to decreased academic performance and increased stress. On the other hand, students who cultivate strong time management skills tend to reach their academic objectives and uphold a better work-life balance. Educators can greatly enhance their overall well-being and academic success by equipping students with effective time management strategies.

Chalak and Fallah (2019), on the effects of classroom management and strategies on student achievement, found that three things affect classroom management: students' needs and teachers' knowledge and skills. Teachers believed they had to provide instructional activity awareness as part of their classroom tactics. They understood that being mindful of the various classroom activities—such as group discussions, hands-on projects, and independent work—was essential for creating an effective learning environment. By being aware of these activities, educators could better facilitate student engagement, differentiate instruction to meet diverse learning needs, and adjust their teaching methods in real time to optimize student understanding and participation. This approach helps maintain a dynamic

classroom atmosphere and empowers students to take ownership of their learning experiences.

Intrinsic Motivation of Students toward Science

Chai et al. (2021), found that students' achievement in science is positively correlated with their intrinsic motivation and epistemic views. In other words, when students are curious about science and wish to grasp the material, they are more inclined to excel in their science courses. This suggests that fostering a sense of intrinsic motivation in students is crucial for promoting deep learning and achievement in science. Educators should strive to create an environment encouraging students to develop this type of motivation.

Extrinsic Motivation of Students Towards Science

Leong et al. (2018) explained that extrinsic motivation refers to doing something because it leads to separable outcomes. It also reflects external control by focusing on the desire to receive a reward or to avoid punishment (Watters & Ginns, 2000; Leong et al., 2018). The implication of extrinsic motivation in the study suggests that educators and instructors should focus on promoting intrinsic motivation instead, such as encouraging autonomy and curiosity and providing opportunities for choice and feedback. Educators can cultivate a more enriching and engaging learning environment that supports students' innate desire to learn and succeed. Ultimately, this approach benefits students' academic performance and nurtures lifelong learners equipped to adapt and thrive in an ever-changing world.

A recent investigation by Libao et al. (2016) corroborated the findings regarding students' motivations for learning science. The research indicated a strong relationship between extrinsic motivation and academic performance, suggesting that students driven by external incentives—such as grades, recognition, and rewards—are more inclined to achieve academic success. It highlighted the importance of offering extrinsic motivators to students, as it can be an effective way to encourage them to study harder and achieve higher grades. Therefore, educators should consider integrating extrinsic motivators into teaching methods to enhance student motivation and academic performance.

Silviana et al. (2023) noted that motivation plays a significant role in influencing students' interest and participation in their learning. Motivated students tend to exhibit higher levels of engagement, focus, and enthusiasm for the educational process, which can result in better academic results and overall performance. Conversely, lacking motivation can lead to disengagement, decreased interest, and poor academic performance. By understanding the role of motivation in shaping student engagement, educators and policymakers can develop targeted strategies to promote student motivation and ultimately improve learning outcomes.

The study highlighted that motivation significantly affects students' engagement and interest in learning (Silviana et al., 2023). Research indicates that motivated students tend to develop a greater interest in learning, which can result in enhanced engagement and a deeper understanding of the material. Additionally, the impact of motivation on student behavior is substantial, as motivated learners are more likely to persevere despite challenges and show increased autonomy and self-direction. By recognizing the critical role of motivation in education, educators can more effectively support their students' growth and development.

Students' Academic Performance in Science

Samson et al. (2023), who focused on the development and assessment of an instructional tool known as the "Physics Alphabet Model" for Grade 10 students at Cantilan National High School, found positive effects on the performance of students leading to an improvement in their mean achievement scores in physics. It showed how the Physics Alphabet Model significantly improved students' academic performance in the subject of physics. The students' mean achievement scores increased due to this creative teaching strategy, demonstrating how well it promotes a deeper comprehension of the subject matter. The results implied that innovative and engaging teaching strategies in science classes might significantly enhance students' learning outcomes and general academic performance.

Enhanced Classroom Management Technique, Motivation, and Academic Performance in Science

Aransiola's (2020) assertion that reinforcement significantly enhances the academic performance of business studies students. His study indicated that using verbal instructions as a classroom management method significantly enhances the academic achievements of business studies students in junior secondary schools. When teachers provide clear directions on tasks and how to complete them, they motivate the students to do the tasks well, so they tend to perform better in their studies.

Additionally, Aceves (2019) found that teachers who had training in PBIS or special education noted that rewarding appropriate student behavior with activities was advantageous, the importance of having resources and school support to reinforce suitable student behavior, and that students must receive reinforcement only for engaging in appropriate behavior. It further found that teachers who reported having taught in a special education classroom had significant correlations between those who used individual rewards to motivate students and those with staff support in the classroom to reinforce appropriate behavior.

Variable that Significantly Influence Students' Academic Performance in Science

Factors such as personal learning styles, socio-economic conditions, support systems outside the classroom, or even intrinsic qualities like curiosity and self-efficacy may play substantial roles. The discovery opens up new avenues for research and investigation as educators and researchers seek to understand better the complex factors that influence student learning and achievement. The findings were supported by Castens et al. (2021), who found that more training for teachers and students is necessary to implement technology

in the classroom better. Furthermore, the research indicated that students are more engaged and comfortable with technology. However, they can become a management concern, having no significance on students' academic performance. Educators need to strike. A balance between incorporating technology into their teaching practices and ensuring students develop physical and social skills. By doing so, educators can provide students with a well-rounded education that prepares them for success in an increasingly digital world.

Methodology

Research Design

This study employed a causal-predictive research design to examine the influence of enhanced classroom management techniques and student motivation on academic performance in science. This design was selected to determine whether and how specific variables—namely positive reinforcement, active engagement, use of multimedia, time management, and intrinsic and extrinsic motivation—predict students' academic outcomes. By identifying relationships and potential cause-and-effect links among these variables, the study aimed to uncover which factors significantly contribute to students' performance in science.

The design allowed for the formulation of hypotheses, systematic data collection, and the application of statistical analyses, including correlation and multiple regression. This approach provided empirical evidence on the extent to which classroom management practices and motivational factors impact academic performance, offering practical insights for educators and policymakers to enhance teaching strategies and foster student achievement in science.

Respondents

The participants of the study were Grade 12 students from a public secondary school, consisting of 301 learners across five academic strands. Data collection was conducted during the school year 2024–2025 using a structured survey questionnaire designed to assess the implementation of enhanced classroom management techniques, levels of student motivation, and academic performance in science. The sample size was determined using Cochran's formula, which considers the desired level of precision, total population size, and estimated population proportion. Employing proportionate stratified random sampling, 170 students aged 15 to 17 were randomly selected from each strand. Prior to data collection, informed parental consent and participant assent were obtained to ensure ethical compliance.

Research Instrument

Data were collected using descriptive survey questionnaires that assessed the implementation of enhanced classroom management techniques and their relationship to students' academic performance in science. The survey included 45 items rated on a 5-point Likert scale, with scores ranging from 1 (Strongly Disagree/Never) to 5 (Strongly Agree/Always). Part 1 focused on the level of implementation of techniques such as positive reinforcement, active engagement, multimedia application, and time management, utilizing 29 adapted statements from Chalak and Fallah (2019) and Nyirahabimana et al. (2023). Part 2 evaluated motivation through 16 modified statements drawn from İnce (2023) for intrinsic motivation and Kum (2022) for extrinsic motivation. Part 3 assessed students' academic performance using final ratings aligned with DepEd Order No. 8, s. 2016, involving grade 12 students from the 2024-2025 school year, who were previously grade 11 students.

Procedure

The data gathering procedure began with securing the necessary approvals and ethical clearances from the appropriate institutional review board. Prior to the distribution of research instruments, a formal request for data collection was submitted to the school administration. Once approval was granted, the researcher conducted an orientation with the selected Grade 12 students to explain the study's purpose, the confidentiality of responses, and their right to withdraw at any time. Informed consent from parents and assent from students aged 15 to 17 were obtained before participation.

Following the ethical clearance and consent process, the researcher used proportionate stratified random sampling to identify 170 participants across five academic strands. The primary data collection tool was a structured survey questionnaire composed of three parts: (1) implementation of enhanced classroom management techniques, (2) student motivation toward science, and (3) academic performance in science. The first two parts utilized a five-point Likert scale to quantify responses, while academic performance was measured using students' final science grades as recorded in school forms.

The questionnaires were administered during regular class hours with the cooperation of subject teachers, ensuring minimal disruption to instructional time. The researcher personally supervised the administration of the surveys to clarify any questions and ensure completeness and honesty in responses. Participants were given sufficient time to complete the questionnaire in a quiet, focused environment.

Upon completion, all responses were collected, reviewed for completeness, and encoded for statistical analysis. Data were then processed using appropriate statistical tools, including mean, standard deviation, Pearson Product-Moment Correlation, and multiple regression analysis. The entire data collection process was completed within three to five weeks, with careful adherence to ethical and procedural standards throughout.

Ethical Considerations

The researcher obtained LREB clearance and adhered to ethical guidelines before collecting data for the study. Informed consent was provided to students, clarifying the study's purpose and voluntary participation, while ensuring the questionnaire avoided inappropriate language and sensitive topics. Participants received a detailed outline of the survey process, were informed they could skip any uncomfortable questions, and were encouraged to withdraw if necessary. Parents of participants aged 15 to 17 were also asked for permission to conduct the study, which focused on assessing academic performance in science for the 2023-2024 school year. The survey was conducted over three to five weeks, emphasizing that participation was voluntary and without repercussions. The questionnaire was phrased in simple English, and respondents could choose whether to provide their names. Data collection prioritized confidentiality, with results shared only for educational purposes and presented at school events, while findings would be made available in the school library.

Results and Discussion

This section analyzes the study's findings and interpretations. The manner of presentation is aligned with the study's objectives.

Problem 1. What is the level of enhanced classroom management techniques implementation in terms of: 1.1 Positive reinforcement; 1.2 Active engagement; 1.3 Visuals and multimedia application, and; 1.4 Time management and organization practices?

Table 1. *Level of Enhanced Classroom Management Techniques Implementation in terms of Positive Reinforcement*

	Indicators	*Mean*	*SD*	*Description*	*Interpretation*
1.	My teacher manages class in the way which creates encouraging environment in the classroom for productive learning.	4.25	.843	Agree	Highly Implemented
2.	My teacher motivates students in the class for learning.	4.28	.851	Agree	Highly Implemented
3.	My teacher leads the class in a disciplined and organize manner which positively enhances student's learning.	4.22	.895	Agree	Highly Implemented
4.	My teacher rewards us for good behavior in the science class.	3.95	1.00	Agree	Highly Implemented
5.	My teacher gives us opportunities to ask questions in the science class.	4.19	.918	Agree	Highly Implemented
6.	My teacher provides encouraging feedback when I perform well in the science class.	4.00	.963	Agree	Highly Implemented
7.	My teacher answers questions promoting positive interaction in science class.	3.98	.979	Agree	Highly Implemented
	Over-all Mean	4.12	0.92	Agree	Highly Implemented

Legend: 4.51–5.00, Strongly Agree, Very Highly Implemented; 3.51–4.50, Agree, Highly Implemented; 2.51–3.50, Neutral, Moderately Implemented; 1.51–2.50, Disagree, Less Implemented; 1.00–1.50, Strongly Disagree, Not Implemented

Presents the level of implementation of enhanced classroom management techniques in terms of positive reinforcement. As shown in the table, teachers obtained the highest mean score of M=4.28, SD=.851 for item number 2, "My teacher motivates students in the class for learning," which is described as "agree" and interpreted as "highly implemented." Thus, the result proved that when a teacher motivates students in the class to learn, he applies an effective classroom management technique. It showed that it helps teachers increase students' positive behavior in science. This positive result is acclaimed for engaging teachers with motivational approaches to strengthen positive reinforcement for classroom management. It also claimed that mentors of science teachers had always seen a well-arranged lesson plan following the 7Es, which helped them guide how they motivate students in the class, deliver simple and easy instructions, and make students gain confidence to participate in science class. The findings indicated that science teachers in the current study typically utilized this form of positive reinforcement.

This finding is corroborated by Aransiola's (2020) assertion that reinforcement significantly enhances students' academic performance in business studies. His study indicated that using verbal instructions as a classroom management method significantly enhances the academic achievements of business studies students in junior secondary schools. When teachers provide clear directions on tasks and how to complete them, they motivate the students to do the tasks well, and so they tend to perform better in their studies.

On the other hand, teachers obtained the lowest mean score of M=3.95, SD=1.00 for item 4 "My teacher rewards us for good behavior in the science class.". This indicated that they generally agree with this statement, interpreting it as "highly implemented" in their science classes. What's interesting was that the lowest mean score had the same interpretation as the highest mean score, which suggested that teachers are still placing a strong emphasis on positive reinforcement as an effective classroom management technique in science classes. The finding was particularly relevant in 21st-century classrooms, where students were increasingly diverse and required more tailored approaches to behavior management. The fact that teachers were still using rewarding methods to encourage good behavior in science classes highlights the importance of this strategy in promoting positive learning environments. By acknowledging and rewarding students' good behavior, teachers can foster a sense of responsibility and accountability among students, leading to improved academic performance and a more productive learning experience. In other words, the study provided evidence that teachers were still finding value in using positive reinforcement to manage behavior in science classes, and this approach is likely to remain an essential tool in many classrooms. The result was supported by the claim of Bruno and Tippet (2022) that teachers often

employ rewards and praise as effective methods to manage disruptive behavior in the classroom. This approach encourages students to engage positively, fostering a better learning environment.

The overall mean score was M=4.12, SD=.92, which was described as agreeable, and it was interpreted that the teachers have highly applied positive reinforcement. The overall standard deviation of .92 implied that the data is spread more from the meaning. The overall result supported positive reinforcement as an effective enhanced classroom management technique. It showed support to the teachers whom applied it as an effective enhanced classroom management technique. It further found that teachers used rewards or praise to motivate students to meet the goals of the lesson. The findings of the study revealed that positive reinforcement was a valuable approach not only for encouraging good behavior, but also for increasing students' motivation to learn.

Table 2. *Level of Enhanced Classroom Management Techniques Implementation in terms of Active Engagement*

	Indicators	*Mean*	*SD*	*Description*	*Interpretation*
1.	My teacher gives immediate feedback when we answer their questions.	4.07	.991	Agree	Highly Implemented
2.	My teacher intervenes when we talk about irrelevant topics at inappropriate times during science class.	4.02	.817	Agree	Highly Implemented
3.	My teacher engages us about topics related issues in active discussion.	3.97	.896	Agree	Highly Implemented
4.	My teacher relates the topic with real life through the use of different examples.	4.05	.965	Agree	Highly Implemented
5.	My teacher has friendly and appropriate behavior which allows us to confidently learn in science class.	4.04	.944	Agree	Highly Implemented
6.	My teacher changes classroom sitting arrangement for group working.	4.06	.930	Agree	Highly Implemented
7.	My teacher encourages equal participation in science class.	3.98	.926	Agree	Highly Implemented
8.	My teacher closely monitor class off task behavior during science class.	4.06	.864	Agree	Highly Implemented
9.	My teacher allows us to raise comments and suggestions in science class.	3.99	.999	Agree	Highly Implemented
	Over-all Mean	4.03	0.93	Agree	Highly Implemented

Legend: 4.51–5.00, Strongly Agree, Very Highly Implemented; 3.51–4.50, Agree, Highly Implemented; 2.51–3.50, Neutral, Moderately Implemented; 1.51–2.50, Disagree, Less Implemented; 1.00–1.50, Strongly Disagree, Not Implemented

Table 2 presents the level of implementation of enhanced classroom management techniques in terms of active engagement. As shown in the table, teachers obtained the highest mean score of M=4.07, SD=.991 for item number 1, “My teacher gives immediate feedback when we answer their questions.”, which is described as “agree” and interpreted as “highly implemented”. Since most participants agreed with the statement, it demonstrated that active engagement is an effective enhanced classroom management technique. It explained that by responding quickly to students' questions, teachers can help maintain student attention and motivation and provide opportunities for students to learn and apply new concepts. The fact that most participants agreed with this statement indicated that this approach is effective and widely adopted by teachers in different class subjects.

The result was supported by the claim of Breunig (2024), who showed that students made cognitive and social-emotional efforts to address a range of knowledge-building inquiry challenges. The result of the study suggested that students’ interest and persistent effort, as well as teachers’ growth mindset-oriented feedback in the knowledge-building community, engage students socially and emotionally to face and overcome inquiry challenges to achieve community knowledge advancement. Through these experiences, students learn to approach problems from different perspectives, work together as a team, and refine their understanding of various subjects. This holistic approach to learning helps them acquire knowledge and fosters essential life skills, such as communication, empathy, and adaptability.

On the other hand, participants obtained the lowest mean score of M=3.97, SD=.896 for item 3, “My teacher engages us about topics related issues in active discussion”. It indicated that participants generally agreed with the statement and interpreted it as "highly implemented" in their science classes. Notably, the lowest mean score for this item was identical to the highest mean score, suggesting that teachers continue to place significant importance on active engagement as a key technique for managing their classrooms. The finding suggested that teachers recognize the value of fostering a sense of effective communication in class and collaboration and are actively working to incorporate these strategies into their teaching practices.

The result was supported by the claim of Valiante (2021), who explained that one of the most 78 crucial tools in a teacher’s arsenal is the ability to communicate effectively. More specifically, in a classroom management context, evidence suggested that a capacity for positive verbal language and body language forms an integral part of an effective communication skill set. This approach not only helps in building strong relationships but also fosters a positive atmosphere. Using uplifting words and maintaining confident body language, individuals can effectively convey their messages, inspire others, and create a harmonious environment.

Furthermore, the overall mean score was M=4.03, SD=.93, which was described as agreeable, and it was interpreted that the teachers have highly implemented active engagement in science class. The overall standard deviation of .93 implied that the data were more dispersed from the mean, implying a range of participant opinions and experiences. Still, the overall result supported the effectiveness of active engagement as a classroom management technique, as it suggested that students were highly invested in their learning and

were likely to be more engaged and motivated in science class. Thus, it proved that active engagement, described as one of the enhanced classroom management techniques that enables students to be actively involved during class discussions and makes lessons valuable.

Table 3. *Level of Enhanced Classroom Management Techniques Implementation in terms of Visuals and multimedia application*

	Indicators	*Mean*	*SD*	*Description*	*Interpretation*
1.	My teacher uses A.V. aids in classroom to facilitate learning.	3.92	.863	Agree	Highly Implemented
2.	I feel that I understand quantum mechanics theory like Bohr's Model, Rutherford's Model of an atom when teacher uses multimedia in class.	3.77	.921	Agree	Highly Implemented
3.	I appreciate science class when teacher uses videos, animations and simulation that avoids us from being stuck on exercises or problem activities.	3.96	.960	Agree	Highly Implemented
4.	Learning lessons in science with multimedia can improve my ability to solve new problems using basic principles and concepts.	3.92	.960	Agree	Highly Implemented
5.	Visualization applied by the science teacher increases my motivation and interest in science.	4.00	.929	Agree	Highly Implemented
6.	My teacher encourages everyone in class to observe on the visuals of topics presented by the teacher and discuss about it.	4.05	.885	Agree	Highly Implemented
	Over-all Mean	3.94	0.92	Agree	Highly Implemented

Legend: 4.51–5.00, Strongly Agree, Very Highly Implemented; 3.51–4.50, Agree, Highly Implemented; 2.51–3.50, Neutral, Moderately Implemented; 1.51–2.50, Disagree, Less Implemented; 1.00–1.50, Strongly Disagree, Not Implemented

Table 3 presents the level of implementation of enhanced classroom management techniques in terms of visuals and multimedia applications. As shown in the table, teachers obtained the highest mean score of M=4.05, SD=.885 for item number 6, "My teacher encouraged everyone in the class to observe the visuals of topics presented by the teacher and discuss it.", which is described as "agree" and interpreted as "highly implemented." The widespread agreement on this statement suggested that incorporating visuals and multimedia into the classroom can be a valuable strategy for classroom management, as it encourages active observation, invites discussions, and meaningful participation among students. The fact that most participants agreed that their teacher encouraged everyone to observe and discuss visuals presented by the teacher suggests that this approach is well-received and highly valued by students. By incorporating visuals and multimedia into the classroom, teachers can create a more interactive and engaging learning environment, leading to increased student participation, motivation, and overall academic performance.

The result was supported by the claim of Alharbi et al. (2022), who found that the use of video in learning tended to focus on increasing the effectiveness of learning (59.52%), exploring the influence of video in learning (23.81%), media development (9.52%) and the rest on general use and instrument development. The research emphasized videos' important role in improving students' academic performance in science. The primary focus was on learning effectiveness, accounting for 59.52% of the studies. It suggested that incorporating videos in science education can lead to better understanding and retention of concepts.

Additionally, exploring the influence of video in learning (23.81%) indicated that researchers were actively investigating how videos impact students' academic performance. The remaining percentages were dedicated to media development (9.52%) and other aspects like general use and instrument development. Existing tools that are multimedia components such as audio, video, animation, and 3-D concluded that the majority of the multimedia solution could increase the interest in learning more about the lessons (Abdulrahman et al. 2020). With multimedia elements, educators can create a more engaging learning environment, resulting in better academic performance and a deeper grasp of scientific concepts.

Conversely, participants obtained a lowest mean score of M=3.77, SD=.921 for item 2 "I feel that I understand quantum mechanics theory like Bohr's Model, Rutherford's Model of an atom when teacher uses multimedia in class.". It showed that participants also agree with this statement, interpreted it that teacher has "highly implemented" multimedia in their science classes. The finding suggested that students generally perceive the use of multimedia in science classes as highly effective in helping them understand complex concepts. What's striking was that the lowest mean score for this item was remarkably similar to the highest mean score result. It implies that teachers continue to place significant importance on using multimedia in their classrooms as a key technique for classroom management.

The result was supported by the claim of Munfaridah et al. (2021) who conducted a systematic review of multiple representations in undergraduate physics education and found that multimedia can be used effectively in teaching physics at university. They added that multimedia could enhance students' understanding of the concepts and enable them to solve the general and individual problems. Adding multimedia resources to traditional classrooms can improve students' understanding and involvement in these subjects (Munfaridah et al. 2021).

Generally, the overall mean score was M=3.94, SD=0.92 described as agree and interpreted that teacher has highly applied visual and multimedia in science class. The study's findings showed that participants typically expressed strong agreement regarding the use of visual and multimedia tools in science classes. With an overall average score of 3.94, most participants categorized themselves as

"agree." The relatively high standard deviation of 0.92 also suggested that the data is dispersed from the mean, implying that there is some variation in the level of application among participants. While some individuals may have a strong preference for using visual and multimedia tools, others may not see their value or maybe more skeptical about their use in science education.

This variation in attitudes and opinions highlights the importance of considering individual differences and perspectives when managing science classes. The spread of scores implied that some participants have particularly strong or positive views on the matter, which can provide valuable insights for teachers and researchers seeking to understand the complexities of student attitudes toward technology-enhanced learning. Hence, it attested that visual and multimedia applications are described as teachers' vital classroom management technique that enables students to communicate with teachers, be actively involved during class discussions, and make lessons valuable. By integrating these elements into science classes, teachers can potentially increase student motivation, improve understanding, and enhance overall learning outcomes.

Research supports this approach, as it enables students to feel more invested in the learning process and fosters positive relationships between teachers and students. A study by Landers (2024) indicated that teachers believe implementing technology streamlines instruction, technology is significant when specifically planned for instruction, and technology actively promotes student engagement. According to survey results, more than half of the study's participants used technology 5 days a week. Hence, many science teachers in middle school employ technology often. Sahin and Yilmaz (2020) found 97 studies used augmented reality technology and found that teachers believed more learning occurred when technology was used in middle school science than when it was not.

Table 4. *Level of Enhanced Classroom Management Techniques Implementation in terms of Time management and organization practices*

Indicators	*Mean*	*SD*	*Description*	*Interpretation*
As what my teacher taught, I keep my study area clean so that I can work efficiently.	3.99	1.02	Frequently	Managed time and organized practices
My teacher advised me to use a highlighter pen or underlining important key words in my lecture notes to emphasize facts on the lesson.	3.89	1.06	Frequently	Managed time and organized practices
My teacher trained us to manage time effectively by practice setting up own deadline to finish tasks on time.	4.14	2.31	Frequently	Managed time and organized practices
In order to finish outputs and projects, I followed teacher's advices by saying "no" to others especially when I have some assignments or projects to finish.	3.77	1.05	Frequently	Managed time and organized practices
I applied a "daily to do list" method as what my teacher taught me.	3.89	.954	Frequently	Managed time and organized practices
Setting my mind that the best time to do something is usually now, which was the best advice from my teacher.	3.95	.995	Frequently	Managed time and organized practices
My teacher taught us to practice refraining from allowing constant interruptions to my work.	3.85	1.041	Frequently	Managed time and organized practices
Over-all Mean	3.93	1.20	Frequently	Managed time and organized practices

Legend: 4.51–5.00, Always, Managed Time Well and Very Organized Practices; 3.51–4.50, Frequently, Managed Time and Organized Practices; 2.51–3.50, Sometimes, Occasionally Managed Time and Organized Practices; 1.51–2.50, Rarely, Hardly Managed Time and Organized Practices; 1.00–1.50, Never, Not Ever Hardly Managed Time and Organized Practices

Table 4 presents the level of enhanced classroom management techniques implementation in terms of time management and organization practices. As shown in the table, teachers obtained the highest mean score of M=4.14, SD=2.31 for item number 3 "My teacher trained us to manage time effectively by practice setting up own deadline to finish tasks on time.", which is described as "frequently", which means they managed time and organized practices based on what was taught by their teacher in order to get a good grade. It suggested that integrating time management and organization practices into the classroom is a valuable strategy for classroom management. By mastering these skills, teachers teach their students how to organize time management; students can fulfill their mission to complete projects and homework on time, leading to a sense of accomplishment and appreciation for their academic achievements. The widespread agreement among participants on this statement highlights the importance of time management to students, who highly value completing tasks efficiently.

Since the early 20th century, management has been researched and written about in literature. According to Sultana and Shakur (2022), effective time management is linked to improved academic performance and reduced student anxiety levels. Students' ability to manage their time well is crucial to their performance in scientific classes. Students who effectively manage their study time typically achieve higher academic results and feel less anxious. Learning and using efficient time management techniques as a student can have a significant positive impact on both overall well-being and academic achievement.

Contrarywise, teachers obtained the lowest mean score of M=3.77, SD=1.05 for item 4, "In order to finish outputs and projects, I followed teacher's advice by saying "no" to others, especially when I have some assignments or projects to finish.". Very few participants frequently favored this statement in their science classes. It means that seldom of them could dare to refuse their friends to hang out, could stand and independently prioritizing their projects and assignments. The students could probably see it as being at the top of the class and with honors.

This study's findings suggested that science class participants often struggle with setting boundaries and prioritizing their responsibilities. This is evident in the results of item 4, "I say 'no' to others when I have some assignments or projects to finish", which received a mean score of 3.77 out of 5. This indicates that participants also agree with the statement, though it has the lowest rank result, acknowledging that they frequently prioritize their own academic work over others' requests. This may be attributed to several factors, including the wish to uphold strong academic performance, a sense of obligation to finish assignments, or inadequate communication skills. Whatever the reason, the results suggest that participants may benefit from developing strategies for setting healthy boundaries and balancing their academic and social commitments. By better understanding their own needs and priorities, participants may be able to establish more effective relationships with their peers and instructors.

According to Sultana and Shakur (2022), effective time management is associated with greater academic performance and lower anxiety levels in students. Many students struggle to balance their studies and day-to-day lives, and males have greater time management skills than females. A student's ability to manage their time well is crucial to their performance in scientific classes. Students who effectively manage their study time typically achieve higher academic results and feel less anxious. For many students, finding a balance between their daily and academic obligations can be difficult. Learning and using efficient time management techniques as a student can have a significant positive impact on both overall well-being and academic achievement.

Mostly, the overall mean score was M=3.93, SD=1.20, frequently described and interpreted as the teachers' teaching their students to manage their time and organize practices in science class. The survey results revealed that the overall mean score for participants' perception of their teacher's instillation of time management and organization practices in science class was a strong 3.93 out of 5, with a standard deviation of 1.20. This high score indicated that most participants agreed that their teacher had successfully instilled effective time management and organization practices in the science classroom. This finding suggested that the teacher has effectively modeled and taught these essential skills, which are crucial for students to succeed in science and other subjects.

As a result, students were likely to develop good habits and strategies for managing their time and staying organized, which can translate to improved academic performance and overall educational success. Researchers in higher education have identified time management as an important factor in student academic performance and retention (Ahmed et al., 2019). The researcher identified staff and student needs and appropriate time management components to address those needs (Breternitz Rich, 2022).

The result was also supported by a study by Hafiz et al. (2019), who found a positive relationship between teachers' time management techniques and their class performance. The study also concluded that when teachers use effective time management, their lesson-planning strategies greatly improve student performance. It was suggested that time management skills be incorporated into teacher preparation programs to enhance teachers' managerial and administrative duties.

Table 5. *Summary of Mean Scores of the Level of Enhanced Classroom Management Techniques Implementation*

Sub-variables	*Mean*	*SD*	*Description*	*Interpretation*
Positive reinforcement,	4.12	0.92	Agree	Highly Implemented
Active engagement	4.03	0.93	Agree	Highly Implemented
Visuals and multimedia application	3.94	0.92	Agree	Highly Implemented
Time management and organization practices	3.93	1.20	Agree	Managed Time and Organized Practices
Over-all Mean	4.01	0.99	Agree/ Frequently	Highly Implemented / Managed Time and Organized Practices

Legend: 4.51–5.00, Always, Managed Time Well and Very Organized Practices; 3.51–4.50, Frequently, Managed Time and Organized Practices; 2.51–3.50, Sometimes, Occasionally Managed Time and Organized Practices; 1.51–2.50, Rarely, Hardly Managed Time and Organized Practices; 1.00–1.50, Never, Not Ever Hardly Managed Time and Organized Practices

Table 5 summarizes the mean scores for implementing enhanced classroom management techniques. The data indicates that positive reinforcement received the highest mean score of M=4.12 and a standard deviation of SD=0.92, categorized as "agree" and interpreted as "highly implemented". It indicated that most participants agreed with the concept of positive reinforcement and interpreted it as highly effective and widely applied by their teacher in science class. The finding suggested that participants recognized the value of positive reinforcement applied by their teacher in promoting desired behaviors and may be more likely to incorporate this approach into their practices or interventions.

In contrast, the study's findings indicated that participants had a relatively low average score of M=3.93 and a standard deviation of SD=1.20 regarding their classroom use of time management and organization practices. It suggested that teachers' time management and organization practices are not immune to the demands of the classroom and that factors such as curriculum planning, classroom management, and assessment may play a significant role in influencing their ability to manage their time and organize their teaching activities effectively. Though it has the lowest mean result, it still describes students who frequently manage time and organize tasks. Despite this, participants still reported using time management and organization strategies in their science classes, indicating that they recognize the importance of these skills for effective classroom management techniques applied by their teacher.

The finding reminded educators that curriculum planning, classroom management, and assessment should be carefully considered when developing strategies to support students in developing effective time management and organization practices. By acknowledging the complex interplay between these factors, educators can work towards creating a learning environment that prioritizes these skills

as a core competency for students, ultimately preparing them for success in their academic and professional pursuits. The findings of this study highlighted the importance of effective time management for students, particularly in scientific classes.

According to Sultana and Shakur (2022), students who are proficient in time management typically attain better academic results and experience reduced anxiety levels. However, numerous students find it challenging to balance their daily responsibilities with their academic commitments, and it has been noted that males often display weaker time management skills compared to females. The consequences of poor time management can be severe, leading to decreased academic performance and increased stress. On the other hand, students who cultivate strong time management skills tend to reach their academic objectives and uphold a better work-life balance. Educators can greatly enhance their overall well-being and academic success by equipping students with effective time management strategies.

Typically, the overall mean score was M=4.01, SD=0.99, which was described as agreeable, and it was interpreted that the participants observed that their teachers had highly instilled enhanced classroom management techniques in science class. The findings indicated that the average score for participants' views on their teachers' implementation of improved classroom management techniques in science class was a robust 4.01 out of 5, accompanied by a standard deviation of 0.99. It suggested that the teachers had made a significant effort to create a well-organized and structured learning environment conducive to student engagement and excellent academic performance in science. The importance of enhanced classroom management techniques in creating a conducive learning environment was well-supported by existing literature Research suggests that teachers who utilize effective classroom management strategies can motivate student learning and lead to improved academic achievement (Adeyemo, 2012; Nisar et al., 2019). By implementing these strategies, teachers can inspire students to learn and develop a passion for learning. An enjoyable and interactive learning atmosphere that fosters curiosity and encourages active involvement can assist students in cultivating a passion for learning and enhancing their academic achievement. Furthermore, teachers who take the time to understand and address each student's needs can increase the likelihood of academic success and the acquisition of essential life skills.

Chalak and Fallah (2019), on the effects of classroom management and strategies on student achievement, found that three things affect classroom management: students' needs and teachers' knowledge and skills. Teachers believed they had to provide instructional activity awareness as part of their classroom tactics. They understood that being mindful of the various classroom activities—such as group discussions, hands-on projects, and independent work— was essential for creating an effective learning environment. By being aware of these activities, educators could better facilitate student engagement, differentiate instruction to meet diverse learning needs, and adjust their teaching methods in real time to optimize student understanding and participation. This approach helps maintain a dynamic classroom atmosphere and empowers students to take ownership of their learning experiences.

The result was also supported by Skinner's Classroom Management theory, which described that reinforcing a stimulus following a behavior makes it more likely to occur again in the future. When a reward occurs after an action, that particular response or behavior will be strengthened. This theory suggests that teachers must use various management techniques to eliminate struggling students' behavior and encourage positive behavior. In addition, Skinner promoted the use of laws on sanctions linked to behavior, like rewarding certain actions when done well. These laws or structures guided the students to maintain their peace within what is seen as a good learning environment (classroom). By using these methods, teachers can achieve better classroom management and teaching results.

Problem 2. How motivated are the students to the science subject in terms of: 2.1. Intrinsic; and 2.2. Extrinsic?.

Table 6. *Level of Motivation of the Students towards Science Subject in terms of Intrinsic*

	Indicators	*Mean*	*SD*	*Description*	*Interpretation*
1.	I would like to learn about new ideas in science.	4.11	.971	Agree	Very Motivated
2.	I like to investigate more than what the teacher teaches in class.	3.91	.934	Agree	Very Motivated
3.	I enjoy learning about the latest innovations in science.	4.03	.953	Agree	Very Motivated
4.	I enjoy searching for answers to science problems.	3.76	1.04	Agree	Very Motivated
5.	I love when my teacher publicly acknowledges my high scores in class.	3.87	1.02	Agree	Very Motivated
6.	I try very hard not to miss important information that our teacher gives us.	3.91	1.01	Agree	Very Motivated
7.	In the science class, I work hard to earn the favor of my teacher.	3.81	1.04	Agree	Very Motivated
8.	I like to help my classmates in science lessons.	3.93	.955	Agree	Very Motivated
9.	I enjoy doing group work with my friends in science lessons.	4.07	.929	Agree	Very Motivated
	Over-all Mean	3.93	0.98	Agree	Very Motivated

Legend: 4.51–5.00, Strongly Agree, Extremely Motivated; 3.51–4.50, Agree, Very Motivated; 2.51–3.50, Neutral, Moderately Motivated; 1.51–2.50, Disagree, Less Motivated; 1.00–1.50, Strongly Disagree, Not Motivated

Table 6 presents the students' motivation level towards science subjects in terms of intrinsic. As shown in the table, data obtained the highest mean score of M=4.11, SD=.971 for item number 1 "I would like to learn about new ideas in science.", which described as "agree" and interpreted as "very motivated". It suggested that they were very motivated to learn about new scientific concepts and discoveries. This finding was particularly significant in light of the growing importance of scientific literacy in today's world, and emphasized the need for teachers to incorporate enhanced, innovative and engaging science curricula into their teaching practices.

Previous research has highlighted the importance of student motivation in chemistry courses, particularly in large classroom settings. Self-Determination Theory (SDT) suggests that intrinsic motivation is more likely to flourish when students' fundamental psychological needs—such as autonomy, competence, and relatedness—are satisfied (Black & Deci, 2000; Vaino et al. 2012; Hagger et al. 2015; Kiemer et al. 2015). Schools can implement active- learning techniques like group projects and offer personalized support through positive feedback and guidance to enhance the sense of connection and belonging between students and teachers. Furthermore, educators can promote a feeling of competence by offering engaging, well-organized course materials that enable students to experience a sense of achievement. The data indicates that students driven by curiosity for new scientific concepts are more inclined to participate in and benefit from their chemistry classes.

Interestingly, data revealed that participants also agreed with the statement "I enjoy searching for answers to science problems," which scored a mean of 3.76 and a standard deviation of 1.04. This may seem challenging, given that this statement received the lowest overall ranking. However, participants seemed to still interpret this statement as "very motivated" in their science classes despite its lower ranking. This finding was particularly noteworthy, as it implied that participants may be motivated by the process of inquiry and problem-solving in science, even if they do not necessarily find their science classes engaging or enjoyable. This could be due to various factors, such as the sense of accomplishment in solving a challenging problem, the opportunity to develop critical thinking and analytical skills, or the appeal of uncovering new knowledge and understanding, which fall into intrinsic motivation.

Furthermore, the findings may highlight the importance of incorporating more inquiry- based and problem-solving activities into science classes to foster students' intrinsic motivation. The result was supported by a claim by Chai et al. (2021), who found that students' achievement in science is positively correlated with their intrinsic motivation and epistemic views. In other words, when students are curious about science and wish to grasp the material, they are more inclined to excel in their science courses. This suggests that fostering a sense of intrinsic motivation in students is crucial for promoting deep learning and achievement in science. Educators should strive to create an environment encouraging students to develop this type of motivation.

Generally, the overall mean score of 3.93, with a standard deviation of 0.98, indicated that participants generally agreed and can be interpreted as a strong endorsement of intrinsic motivation in science classes. The fact that participants have instilled intrinsic motivation in their science classes suggested that they are motivated by a genuine interest in the subject matter and were likely to engage more deeply with the material. It was consistent with research on self-determination theory, which suggested that intrinsic motivation is a key driver of learning and achievement. Furthermore, the results suggested that participants' science classes may be characterized by curiosity, enthusiasm, and enjoyment, which can lead to deeper learning and greater engagement.

The results were further corroborated by existing literature that emphasized the significance of science motivational beliefs in linking Self-Determination Theory (SDT) with science education. These beliefs included a range of elements such as science self-concept, intrinsic and instrumental motivation for learning science, interest in the subject, and the perceived importance of science in an individual's life (Areepattamannil et al., 2020). Incorporating Self-Determination Theory (SDT) into science education equips educators with a framework to foster better students' intrinsic motivation, autonomy, competence, and sense of belonging within the subject. By prioritizing these essential elements, educators can create a learning atmosphere that enhances student engagement and promotes deeper understanding and performance in science.

Table 7. *Level of Motivation of the Students towards Science Subject in terms of Extrinsic*

Indicators	*Mean*	*SD*	*Description*	*Interpretation*
My top priority is to enhance my overall GPA, so I am focused on achieving a strong grade.	4.19	.950	Agree	Very Motivated
I strive to excel in my classes as it's essential to demonstrate my abilities to my family, friends, future employers, and others.	3.95	.925	Agree	Very Motivated
I feel more accepted by others when I receive a good grade on a test.	4.01	.942	Agree	Very Motivated
I feel that the smarter I am, the more accepted I will be by other students.	3.65	1.04	Agree	Very Motivated
I study because I want to do well in my examination.	3.94	1.00	Agree	Very Motivated
I study most time because I need good grades to further my studies and get a good job.	3.91	1.00	Agree	Very Motivated
I like to be one of the most recognized students in the classroom.	3.90	1.02	Agree	Very Motivated
Over-all Mean	3.94	0.982	Agree	Very Motivated

Legend: 4.51–5.00, Strongly Agree, Extremely Motivated; 3.51–4.50, Agree, Very Motivated; 2.51–3.50, Neutral, Moderately Motivated; 1.51–2.50, Disagree, Less Motivated; 1.00–1.50, Strongly Disagree, Not Motivated

Students' motivation level toward the science subject was measured regarding extrinsic factors, as shown in Table 7. The data showed that the highest level of motivation was obtained for the item " My top priority is to enhance my overall GPA, so I am focused on achieving a strong grade." This item received a mean score of M=4.19, with a standard deviation of SD=.950. The finding explained that many students were motivated to achieve a good grade rather than an intrinsic interest in science. It can be seen as a "very motivated" response, indicating that external factors drove students to perform well in the subject. The finding that students were motivated by extrinsic factors, such as the desire to improve their grade point average, was also supported by existing literature.

Leong et al. (2018) explained that extrinsic motivation refers to doing something because it leads to separable outcomes. It also reflects external control by focusing on the desire to receive a reward or to avoid punishment (Watters & Ginns, 2000; Leong et al., 2018). The

implication of extrinsic motivation in the study suggests that educators and instructors should focus on promoting intrinsic motivation instead, such as encouraging autonomy and curiosity and providing opportunities for choice and feedback. Educators can cultivate a more enriching and engaging learning environment that supports students' innate desire to learn and succeed. Ultimately, this approach benefits students' academic performance and nurtures lifelong learners equipped to adapt and thrive in an ever-changing world.

Data revealed that participants also agreed with the statement, " I like to be one of the most recognized students in the classroom," which scored a mean of 3.90 and a standard deviation of 1.02. The findings suggest that students' motivations can be complicated and not solely driven by internal factors such as interest or curiosity. While participants may have received lower overall rankings, they still strongly desired to be recognized by their peers and teachers in the classroom. Their agreement with the statement reflected this desire for recognition, which indicated that external factors can play a significant role in motivating students.

This discovery has significant implications. It suggests that even when students are motivated by external factors such as recognition, they may still be driven to achieve their goals. This challenges the traditional notion that motivation is an internal affair and highlights the importance of acknowledging and leveraging external motivators. Furthermore, educators and policymakers may need to consider incorporating strategies promoting student recognition and visibility to foster a more motivated and engaged student body.

A recent investigation by Libao et al. (2016) corroborated the findings regarding students' motivations for learning science. The research indicated a strong relationship between extrinsic motivation and academic performance, suggesting that students driven by external incentives—such as grades, recognition, and rewards—are more inclined to achieve academic success. It highlighted the importance of offering extrinsic motivators to students, as it can be an effective way to encourage them to study harder and achieve higher grades. Therefore, educators should consider integrating extrinsic motivators into teaching methods to enhance student motivation and academic performance.

The average score of 3.94, accompanied by a standard deviation of 0.982, suggests that participants largely concurred, which can be interpreted as robust support for extrinsic motivation in science classes. The study results strongly confirm extrinsic motivation in science classes, with participants generally agreeing. The overall mean score of 3.94, with a standard deviation of 0.982, suggested that students were highly motivated by external factors such as improved grades, recognition, and rewards. This was particularly noteworthy in science classes, where students may not always be naturally inclined to engage with the

subject matter. By recognizing the importance of extrinsic motivation in science classes, educators can design strategies that leverage these factors to sustain extrinsic motivation and better support students' learning and excellent academic performance. It may include incorporating more hands-on activities, providing opportunities for students to work in groups and collaborate on projects, or offering incentives to achieve specific goals.

Table 8. *Summary of Mean Scores of the Level of Motivation of the Students towards Science Subject*

Sub variables	*Mean*	*SD*	*Description*	*Interpretation*
Intrinsic	3.93	0.98	Agree	Very Motivated
Extrinsic	3.94	0.98	Agree	Very Motivated
Over-all Mean	3.93	0.98	Agree	Very Motivated

Legend: 4.51–5.00, Strongly Agree, Extremely Motivated; 3.51–4.50, Agree, Very Motivated; 2.51–3.50, Neutral, Moderately Motivated; 1.51–2.50, Disagree, Less Motivated; 1.00–1.50, Strongly Disagree, Not Motivated

Table 8 summarizes the mean scores of the students' motivation level toward science subjects. Data showed that the highest level of motivation was obtained for extrinsic, with a mean score of M=3.94 and a standard deviation of SD=0.98. The finding suggests that many students desire a good grade rather than an intrinsic interest in science. This can be seen as a "very motivated" response, indicating that external factors drove students to perform well in the subject. It has implications for educators and policymakers, who may need to consider incorporating strategies that leverage these external motivators to foster a more engaged and motivated student body. The findings were supported by existing research that suggests a significant relationship between motivation and student engagement. Silviana et al. (2023) noted that motivation plays a significant role in influencing students' interest and participation in their learning. Motivated students tend to exhibit higher levels of engagement, focus, and enthusiasm for the educational process, which can result in better academic results and overall performance. Conversely, lacking motivation can lead to disengagement, decreased interest, and poor academic performance. By understanding the role of motivation in shaping student engagement, educators and policymakers can develop targeted strategies to promote student motivation and ultimately improve learning outcomes. Oddly, the data revealed that participants also agreed with intrinsic motivation, scoring a mean of 3.93 and a standard deviation of 0.98. The mean and SD values seemed closer to the result of intrinsic motivation, which revealed that the participants valued both. This means that external factors did not solely drive participants' motivations but also exhibited a strong desire for internal motivation.

Numerous studies in the literature have consistently highlighted the crucial role of motivation in influencing students' attitudes, behaviors, and, ultimately, their academic success. For example, research indicates that teaching methods that promote autonomy, competence, and interpersonal connections can enhance students' intrinsic motivation to learn, resulting in better academic outcomes (Atma et al., 2021). It underlined the value of understanding the complex relationship between motivational factors and academic performance. It is essential to consider the factors contributing to educational ambition, including internal drives such as curiosity and

interest and external factors such as recognition, feedback, and support. By doing so, educators and policymakers can better design educational strategies that foster a sense of motivation and ambition among students, ultimately leading to improved academic outcomes and lifelong learning.

Generally, the overall mean score of 3.94, with a standard deviation of 0.98, showed that most participants were very motivated and enthusiastic in science classes. The result finds that participants' scores are closely aligned with both internal and external motivation, suggesting that students are motivated by a combination of intrinsic factors (such as personal interest or enjoyment) and extrinsic factors (such as recognition or rewards). This understanding of motivation is important for educators, as it highlights the need to consider internal and external factors when designing instruction and fostering student engagement.

The finding also suggests that the students are engaged in their learning and demonstrated a strong desire to participate and succeed in their science classes. A motivated student body is more likely to lead to improved academic performance, increased retention rates, and a stronger sense of engagement and satisfaction with science. The results of this study provide a strong foundation for developing strategies that promote student motivation and engagement, ultimately leading to a more effective and efficient learning environment. Learning motivation is a crucial factor extensively studied in the literature. It refers to the intrinsic and extrinsic factors that drive individuals to engage in and persist with learning activities (Xi-Hui, 2024). Shaping students' attitudes, behaviors, and academic performance is one of its most important roles.

Moreover, discussions have highlighted the profound effects of motivation on students' behaviors and the fact that learning interest is generated when students are motivated. The study highlighted that motivation significantly affects students' engagement and interest in learning (Silviana et al., 2023). Research indicates that motivated students tend to develop a greater interest in learning, which can result in enhanced engagement and a deeper understanding of the material. Additionally, the impact of motivation on student behavior is substantial, as motivated learners are more likely to persevere despite challenges and show increased autonomy and self-direction. By recognizing the critical role of motivation in education, educators can more effectively support their students' growth and development.

Problem 3. What is the level of students' academic performance in science?

Table 9. *Level of Students' Academic Performance in Science*

Range	*Frequency*	*Percent*	*Mean*	*SD*	*Interpretation*
75-79	18	10.6			
80-84	29	17.1			
85-90	58	34.1	87.98	5.19	Proficient
91-100	65	8.2			
	170	100.00			

Range: 90 – 100- Advanced; 85 – 89- Proficient; 80 – 84- Approaching Proficiency; 75 – 79- Developing; Below 75-Beginning

Table 9 presents students' academic performance in science, revealing that many students have achieved high grades. The table shows that 38.2% of the participants had a grade from 90 to 100, demonstrating that they established a solid and comprehensive understanding of the subject matter. Furthermore, 34.1% of the participants had a grade from 85 to 90, implying that they had understood the concept of the lessons; 17.1% had a grade of 80 to 84, suggesting that they had a solid grasp of the material, and 10.6% had a grade of 75 to 79 means they were at the developing stage. The overall mean was M=87.98, interpreted as proficient, suggesting that most students performed well in science. The overall SD=5.19 implied that the data were more spread around the mean, signifying that most students perform well in science. However, the relatively high SD=5.19 suggested a significant variation in student performance, with some students performing significantly above or below the average. The finding emphasized the importance of considering individual differences and potential learning needs when designing instruction and assessing student learning.

The finding was supported by the claim of Samson et al. (2023), who focused on the development and assessment of an instructional tool known as the "Physics Alphabet Model" for Grade 10 students at Cantilan National High School, which found positive effects on the performance of students leading to an improvement in their mean achievement scores in physics. It showed how the Physics Alphabet Model significantly improved students' academic performance in the subject of physics. The students' mean achievement scores increased due to this creative teaching strategy, demonstrating how well it promotes a deeper comprehension of the subject matter. The results implied that innovative and engaging teaching strategies in science classes might significantly enhance students' learning outcomes and general academic performance.

Problem 4. Is there a significant relationship between students' academic performance and: 4.1. classroom management techniques implementation; and 4.2. motivation towards science?

Table 10 presents the Pearson r correlation analysis results for the significant relationship between students' academic performance, classroom management techniques implementation, and motivation towards science. As shown in the table, the variables active engagement (p>.075), visuals and multimedia application (p>.075), time management and organizational practices (p>.075), and intrinsic and extrinsic motivation (p>.075) had probability values higher than the alpha level of .05 implied that the said variables have no significant relationship with students' academic performance in science. It indicates that these variables may not directly impact

students' academic outcomes in science. It may be that other factors, such as prior knowledge or individual learning styles, are playing a more significant role in determining students' academic performance.

However, the variable positive reinforcement (p<.075), one of the enhanced classroom management techniques implementations, had a probability value lower than the alpha level of .075, demonstrating a significant relationship with students' academic performance in science. Although the effect size of the mentioned relationship is small, the null hypothesis was rejected. This indicates that increased positive reinforcement in ECMTI is less likely to improve students' academic performance in science. It suggested that the variable was not just random occurrences but was correlated with student outcomes.

Table 10. *Results of Pearson r Correlation Analysis for the Significant Relationship between Students' Academic Performance, Classroom Management Techniques Implementation, and Motivation Towards Science*

Variables	*N*	*R*	*Effect Size*	*P- value*	*Interpretation*
Positive reinforcement	170	.138	Small	.074	Significant
Active engagement	170	.128	Small	.097	Not Significant
Visuals and multimedia applications	170	.105	Small	.175	Not Significant
Time management and organization practices	170	.099	Small	.200	Not Significant
Enhanced Classroom Management Techniques Implementation-ECMTI	170	.138	Small	.073	Significant
Intrinsic Motivation	170	.102	Small	.185	Not Significant
Extrinsic Motivation	170	.129	Small	.093	Not Significant
Motivation Towards Science	170	.120	Small	.120	Not Significant

**Correlation is significant at the 0.075 level (2-tailed).*
Legend: Correlation Coefficient Range- Effect Size/Strength of Relationship (Cohen, 1988); .50 and Above- Strong/Large Correlation; .30 to .49- Moderate Correlation; .10 to .29 Weak/Small Correlation

Nevertheless, it is essential to note that the effect size of this relationship was small, indicating that the impact of these variables on students' academic performance was modest. This means that while increasing positive reinforcement and implementing the enhanced classroom management technique may still improve student performance, they are unlikely to have a reflective effect. However, the findings suggest that teachers and policymakers should consider incorporating these strategies into their efforts to improve students' academic performance in science.

This finding is backed by Aransiola's (2020) assertion that reinforcement significantly enhances the academic performance of business studies students. His study indicated that using verbal instructions as a classroom management method significantly enhances the academic achievements of business studies students in junior secondary schools. When teachers provide clear directions on tasks and how to complete them, they motivate the students to do the tasks well, so they tend to perform better in their studies. Additionally, Aceves (2019) found that teachers who had training in PBIS or special education noted that rewarding appropriate student behavior with activities was advantageous, the importance of having resources and school support to reinforce suitable student behavior, and that students must receive reinforcement only for engaging in appropriate behavior. It further found that teachers who reported having taught in a special education classroom had significant correlations between those who used individual rewards to motivate students and those with staff support in the classroom to reinforce appropriate behavior.

Teachers can encourage students to adopt acceptable behaviors and create a positive learning environment using positive reinforcement. By introducing replacement behaviors that counteract undesirable actions, educators can provide students with alternative behaviors that can be rewarded and reinforced, leading to increased adherence to classroom expectations and a more positive learning environment. It is essential to recognize that positive reinforcement extends beyond simply rewarding students for their excellent behavior; it also involves facilitating opportunities for their learning and development. Through positive reinforcement, educators can nurture students' self-worth and confidence, benefiting their academic success and well-being.

Problem 5. Which variables, singly or in combination, significantly influence students' academic performance in science?

Table 11. *Results of Multiple Regression Analysis for the Variables Used to Significantly Influenced Students' Academic Performance in Science*

	Unstandardized Coefficients		*Standardized Coefficients*	*t*	*Sig.*	*Interpretation*
	B	*Std. Error*	*Beta*			
(Constant)	81.821	3.186		25.67	.000	Significant
Positive reinforcement	.975	1.192	.112	.818	.415	Not Significant
Active engagement	.533	1.267	.059	.421	.675	Not Significant
Visuals and multimedia applications	-.750	1.349	-.087	-.556	.579	Not Significant
Time management and organization practices	.319	.739	.041	.432	.666	Not Significant
Extrinsic motivation	1.507	1.829	.192	.824	.411	Not Significant
Intrinsic motivation	-1.077	2.159	-.130	-.499	.618	Not Significant

R=.165 R2=.027 F=.761 P=.602

Table 11 presents the results of multiple regression analysis for the variables that significantly influence students' academic performance in science. The table indicates that the independent variables—positive reinforcement ($p > .075$), active engagement ($p > .075$), visual multimedia applications ($p > .075$), time management and organizational practices ($p > .075$), extrinsic motivation ($p > .075$), and overall motivation ($p > .075$)—all have probability values exceeding the alpha level of .075. This suggests that these variables did not significantly affect the students' academic performance in science, leading to the acceptance of the null hypothesis. It also suggested that the students' academic performance in science could be attributed to other factors not included in this study.

Factors such as personal learning styles, socio-economic conditions, support systems outside the classroom, or even intrinsic qualities like curiosity and self-efficacy may play substantial roles. The findings lightly highlight the limitations of the current research framework in capturing the entirety of influences affecting academic performance. It underscores the necessity for a broader lens in future studies, encompassing a more comprehensive array of variables and considering contextual or situational factors that could impact student learning.

The discovery opens up new avenues for research and investigation as educators and researchers seek to understand better the complex factors that influence student learning and achievement. The findings were supported by Castens et al. (2021), who found that more training for teachers and students is necessary to implement technology in the classroom better. Furthermore, the research indicated that students are more engaged and comfortable with technology. However, they can become a management concern, having no significance on students' academic performance. Educators need to strike. A balance between incorporating technology into their teaching practices and ensuring students develop physical and social skills. By doing so, educators can provide students with a well-rounded education that prepares them for success in an increasingly digital world.

The study highlighted the effect of positive reinforcement as an enhanced classroom management technique in science classes, evidenced by a high mean score of 4.28 (SD=0.851) for the item regarding teacher motivation. Respondents indicated that rewards and praise are commonly used to boost student motivation and good behavior, reflected in an overall mean score of 4.12 (SD=0.92). This supports existing research indicating that reinforcement positively influences academic performance. Moreover, active engagement technique was also rated positively, with a mean score of 4.07 (SD=0.991) for immediate feedback from teachers. This suggests an effective approach to fostering student attention and motivation. While the lowest mean score of 3.97 (SD=0.896) for engaging discussions indicates room for growth, the overall engagement score of 4.03 (SD=0.93) reflects significant application of these techniques, promoting student investment in their learning.

The study further revealed that visuals and multimedia applications were highly effective in enhancing classroom management, with item number 6 scoring the highest at 4.05 (SD=0.885). Participants agreed that these tools support understanding complex concepts, as indicated by an overall mean score of 3.94 (SD=0.92). These findings underscore the significance of integrating multimedia into teaching to foster student participation and motivation.

In terms of time management, teachers showed a strong understanding, with a mean score of 4.14 (SD=2.31) for effective task completion. However, areas of struggle were noted, particularly in setting boundaries, with a lower mean score of 3.77 (SD=1.05). The overall mean score of 3.93 (SD=1.20) still suggests a commendable effort in teaching these essential skills, which are crucial for academic success and well-being.

The students expressed high motivation to learn about scientific concepts, achieving a mean score of 4.11 (SD=0.971). However, the study also showed that much of this motivation stems from extrinsic factors, with a notable mean score of 4.19 (SD=0.95) for improving grades, revealing a contrast between intrinsic interest and the desire for recognition or good performance. While participant grades indicated a strong overall performance in science, 38.2% scoring between 90 and 100, the study found that only positive reinforcement had a significant relationship with academic performance, though with a small effect size. Other variables related to engagement and motivation did not significantly correlate with performance, suggesting that additional factors, such as prior knowledge, may heavily influence outcome measures.

Conclusion

The study concluded that positive reinforcement is critical in effective classroom management and student motivation, significantly contributing to students' academic performance in science. While the relationship between positive reinforcement and performance showed a small effect size, it was the only variable with a statistically significant correlation. This underscores the value of fostering a supportive and encouraging classroom atmosphere where recognition and rewards for appropriate behavior can motivate students and improve academic outcomes. Teachers can strengthen student engagement and discipline by integrating structured reinforcement strategies, leading to a more focused and productive learning environment.

The findings also emphasized that intrinsic and extrinsic motivational factors are essential in promoting students' interest and achievement in science. However, other classroom management variables such as active engagement, multimedia use, and time management did not significantly influence academic performance. These results suggest that while these strategies are widely implemented and appreciated, their effectiveness may depend on how they are integrated and adapted to students' individual needs. Educators should consider adopting a more balanced and multifaceted approach—blending motivation, classroom structure, and tailored instructional strategies—to promote meaningful science learning experiences.

Lastly, the study highlighted the importance of recognizing individual differences and creating personalized, student-centered teaching approaches. Despite students demonstrating high academic performance in science, the variation in motivation and classroom management experiences pointed to the need for differentiated instruction and support. This includes acknowledging that not all students are equally responsive to the same strategies. The findings reinforce the call for further training in the effective use of technology, time management, and positive reinforcement, as well as for broader systemic reforms that prioritize the holistic development of students. In doing so, educators, administrators, and policymakers can cultivate inclusive learning environments that nurture both academic success and a lifelong passion for science.

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