

Influence of Classroom Management Strategies on Chemistry Performance in Public Secondary Schools in Trans Nzoia East Sub-County, Kenya

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Abstract: Good performance in Chemistry is a prerequisite for students aspiring to pursue Science, Technology, Engineering, and Mathematics (STEM) courses in higher education. However, persistent poor performance in Chemistry among secondary schools in Trans Nzoia East Sub-County has raised concerns among education stakeholders. This study examined the influence of classroom management strategies on students' performance in Chemistry. The study specifically sought to determine the influence of classroom management strategies, students' psychological environment, and teachers' characteristics on Chemistry performance. Anchored on McGregor's (1960) Instructional Management Theory, a descriptive survey research design was adopted. The target population comprised 8495 respondents, with a sample size of 385 selected through simple random and purposive sampling. Data collection involved questionnaires, interviews, and document analysis. Descriptive statistics were applied for quantitative data analysis using SPSS Version 25.0, while qualitative data were analyzed thematically. The findings revealed that classroom management strategies significantly influenced Chemistry performance (72.7%), while the classroom psychological environment (68.9%) and teacher characteristics (81.4%) also demonstrated substantial effects. The study recommends prioritizing effective classroom management practices to enhance Chemistry outcomes in secondary schools. These insights will assist teachers and educational policymakers in aligning classroom management with Kenya National Examination Council (KNEC) standards, contributing to improved academic results.

Keywords: Classroom Management Strategies, Chemistry Performance, Secondary Schools, Psychological Environment, Teacher Characteristics, Instructional Management Theory,

I. Introduction

Background of the study

A classroom environment represents a vital space where students and teachers come together within a secure and structured setting designed to promote knowledge acquisition and foster meaningful learning experiences. This environment comprises various dimensions, including the physical surroundings, the psychological atmosphere, the characteristics of the teacher, and the overall classroom climate. Ambrose (2010) conceptualizes the classroom environment as a combination of social, emotional, and instructional elements that collectively shape the learning experience.

Research has consistently demonstrated that multiple aspects of the classroom environment directly affect student motivation and academic efficacy. According to Zysberg and Schwabsky (2021), a positive classroom environment is associated with increased student motivation, which, in turn, encourages learners to invest greater effort into academic activities. Similarly, Wang et al. (2020) and Galos and Aldridge (2021) noted that motivated students are more likely to engage actively in learning processes, leading to improved academic outcomes.

A study conducted in Australian secondary schools explored the relationship between classroom psychological environments and academic efficacy. The findings revealed that classroom climate, considered a multidimensional construct, was positively associated with students' academic, behavioral, and socio-emotional outcomes across educational stages from kindergarten to high school (Zysberg et al., 2021). The results indicated that a positive classroom environment fosters social competence, academic motivation, and achievement among students.

Globally, the economic and technological advancement of nations largely depends on the development and quality of STEM-based education. Croak (2018) emphasized that STEM education promotes innovation, which accelerates progress in fields such as engineering and technology. Chemistry, as a fundamental discipline within the STEM framework, holds a critical position in secondary education. Collins (2017), in a comparative study across 15 countries, concluded that no nation can build a robust scientific and technological enterprise without a solid foundation in chemical education.

In the Philippines, Balasico and Tan (2020) investigated the predictors of high school students' academic performance. Their research found that students who achieved high scores in Mathematics and Science typically displayed positive attitudes toward schooling, possessed effective study habits, and demonstrated high levels of motivation. A similar study in China examined the relationship between students' attitudes toward science and their academic performance in science-related subjects. Mao et al.

(2021) found a significant positive correlation, where students with favorable attitudes towards science performed better in their studies.

In Mexico, Cardellini (2012) observed a common trend across cultures: a declining interest in chemistry among students. His study aimed to make chemistry education more relevant by promoting student interest and curiosity and by illustrating science as a human-centered enterprise. In South Africa, Woldeamanuel et al. (2014) sought to understand students' perceptions regarding the difficulty of chemistry and ways to overcome those challenges. The findings revealed that student-related factors, especially scientific language literacy, greatly influenced their success in the subject.

Within the West African context, analysis of Chemistry performance in the West African Senior School Certificate Examination (WASSCE) revealed persistently high failure rates (Kigbu et al., 2022). In Nigeria, Rhoda and Muktar Alhaji (2016) conducted a study on factors contributing to Chemistry examination failure in Maiduguri secondary schools. Their findings identified significant factors contributing to poor outcomes and emphasized that chemistry remains pivotal to sustainable economic growth and national development.

In Kenya, Chemistry is among the core subjects examined in the Kenya Certificate of Secondary Education (KCSE). However, students' performance in Chemistry has been consistently low. An analysis of past KCSE Chemistry papers indicated that the examinations frequently assessed students' competencies in higher-order cognitive skills, such as evaluation. Anditi and Muchiri (2013) conducted a study involving Form Three Chemistry students from public secondary schools in Kenya's former Rift Valley Province. The study revealed that students in single-sex schools outperformed those in co-educational institutions. These findings underscore the need to assess how classroom management practices and environments influence students' academic performance in Chemistry, particularly in Trans Nzoia County, where performance has been notably poor.

Statement of the Problem

Despite the critical role that Chemistry plays in scientific and technological advancements, secondary school students in Trans Nzoia East Sub-County, Kenya, continue to record poor performance in the subject. According to the KNEC Report (2022), the mean scores in Chemistry in KCSE have been below average, declining from a mean of 53.76 in 2018 to 48.05 in 2022 as evidenced by the low means which are far from the ideal mean. This reflects significant gaps in teaching approaches, including the effectiveness of classroom management strategies.

Secondary schools in Trans Nzoia County have faced persistent challenges in achieving satisfactory performance in chemistry. According to the Kenya National Examinations Council (KNEC) reports, the County's performance in chemistry has consistently fallen below the national average. For instance, between 2018 and 2023, Trans Nzoia County recorded a declining trend in mean scores for chemistry, with most schools reporting poor results year after year. The low achievement in the subject is further manifested in Trans Nzoia East Sub County. According to the Sub County Quality Assurance office (2023), the expected average mean score in chemistry is 6 (grade C plain), but the mean scores in Chemistry at the KCSE level have been on the decline from 3.1 in 2018 to 2.26 in 2022. In 2022, 84.38% of the candidates scored grades D and below which denied them placement in Key STEM-related courses in higher institutions of learning according to the data from the Sub-County office. This persistent underachievement has raised concerns among educators, policymakers, and stakeholders in the education sector. Several factors have been identified as contributing to this problem, including inadequate teaching resources, low student motivation, and ineffective classroom management practices.

The extent to which classroom management practices influence Chemistry performance in secondary schools within Trans Nzoia East Sub-County remains underexplored, necessitating an in-depth investigation. This study sought to examine the impact of classroom management practices on Chemistry performance among secondary school students in the region. By identifying effective strategies and their correlation with academic achievement, the findings will provide valuable insights to educators and policymakers in improving teaching and learning processes, ultimately enhancing student performance in Chemistry.

Objective of the Study

To determine the influence of classroom management strategies on Chemistry performance in Public Secondary Schools in Trans Nzoia East Sub County.

Hypothesis

H₀: There is no statistically significant relationship between classroom management strategies and Chemistry performance in secondary schools in Trans Nzoia East Sub County

Conceptual Framework

Independent Variable

Dependent Variable

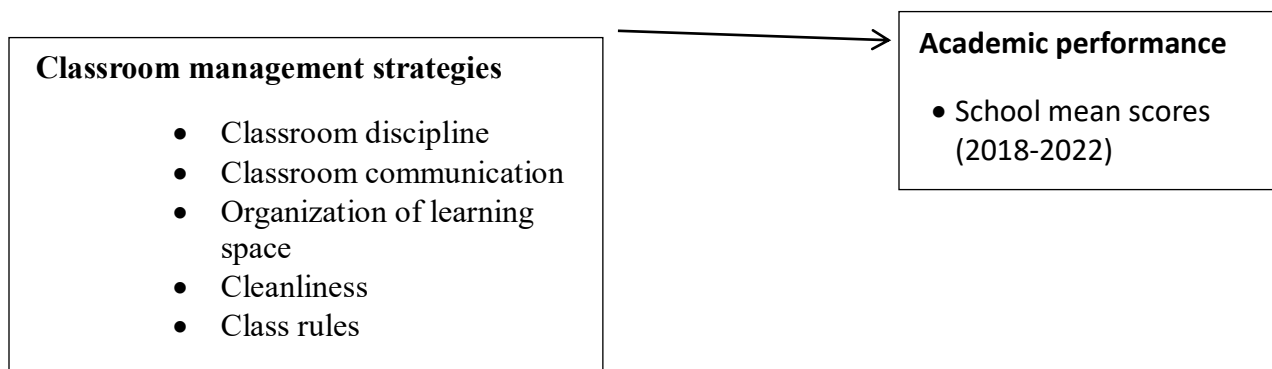


Figure 1: conceptual Framework

THEORETICAL FRAMEWORK

The theoretical framework was based on Albert Bandura's social learning theory of 1977 which asserts that all learning is acquired as a result of direct experience with the object, subject, thing, issue or idea. According to Bandura, people interact with their environment which shapes the behaviour of individuals and vice versa. It emphasizes the immediate social context where an individual observes and interprets the behaviour of other people which in turn would determine their behaviours. Individuals select models and will only adopt the behaviour of the models they deem similar to themselves and whom they esteem. In this light, the learner determines the behaviours to adopt and which others to reject without necessarily engaging in the other's behaviour i.e. through observation. Individual behaviour decisions and perceptions determine also the extent to which one will persist in any task which results in either success or failure of the tasks to be accomplished. Attitudes are therefore learnt experiences through observing, modeling and imitating the subjects in our environment or the behaviour of others. According to Bandura, some behaviour changes may be mediated through modification of the model itself, through role modelling, use of reinforcement and rewards and sometimes through persuasion. For an individual to attempt a modelled behaviour, he must value the observed outcome and perceive it as successful (Schunk & Zimmerman, 2007).

Empirical Literature

Classroom management is one of the most powerful factors in affecting student outcomes. Classroom management refers to the way a teacher organizes and manages variables of the curriculum, time, space, and interactions with students (Setyaningsih & Suchyadi, 2021). Effective classroom management practices (CMP) require a number of procedures which include teaching classroom rules and procedures. Effective CMP involves the teaching of learners' social and emotional skills, learners' acknowledgement of appropriate behaviors and acquisition of desired social skills (Cho *et al.*, 2020). In a normal classroom management practice, the teacher gives differential attention and response to inappropriate behaviors in a positive way ((Setyaningsih & Suchyadi, 2021). The teacher utilizes a variety of instructional models, and maintains well-organized student learning environment. The classroom management practices offered by the teacher include but not limited to effective time management, promotion of emotional and behavioral support and cognitive engagement and re-engagement of all students (Lazarides *et al.*, 2020).

A safe learning space is a pleasant and comfortable environment where learners' express emotions, openly express concerns, share deep thoughts and learn new skills and mindsets (Kisfalvi, & Oliver, 2015). A safe learning space (SLS) is one in which learners are given the confidence to create together, share ideas and thoughts and explore different models of learning (Bramberger & Winter, 2021). The purpose of SLS is to foster creativity, innovation and risk-taking. It's a place in which the learners feel secure enough to take risks, express their views and share and explore their knowledge, attitudes, mindsets and behaviors (Harpalani, 2017). For learning to occur, boundaries have to be pushed, and one has to feel safe and secure (Bramberger, & winter, 2021).

Creating a safe learning space is crucial for any teacher who wishes to expand the creative and innovative capacity of learners (Kisfalvi, & Oliver, 2015). A safe learning space is important for instruction, as a teacher needs a safe environment to engage and inspire the learners (Harpalani, 2017). There is much more to creating a safe learning space than just establishing a relationship with the learners. Creating a safe learning space is about maturity, learning culture and style, and how to engage, inspire, and deliver content to the learner.

Communication is important in the classroom. A successful teaching is considered to require 50% knowledge and 50% communication skills (Elhay & Hershkovitz, 2019). As a result, a teacher needs to be proficient in the four aspects of communication i.e listening, speaking, reading, and writing. A teacher needs to utilize this proficiency effectively in a school

environment (Hussain, 2017). This has proven to impact the success students achieve in their academic lives, as well as the teacher's own career success. Teachers benefit from good communication skills in three different areas: when communicating with students, with parents, and with colleagues. A teacher requires communication skills for interactions with students, because the act of teaching itself requires them.

The teacher is responsible for comprehending and breaking down complex information, conveying this information clearly to students (verbally and written). The information is presented in a manner that sustains learners' attention, listening to and resolving their problems (Wenger *et al.*, 2020). A teacher is required to adapt content for different learning styles, motivate students to learn, build supportive relationships using encouragement and empathy, manage the classroom, and give feedback. These are meant to make a classroom a safe and supportive learning environment (Jamba & Norbu, 2023). For a teacher to do these, requires good communication and classroom management skills. Studies have found that the success of students is directly related to interactive, engaging teaching environments formed by able teachers (Setyaningsih, & Suchyadi, 2021).

Creating a safe learning environment with supportive teachers has a positive impact on class engagement, participation, and the students' achievements (Jamba, & Norbu, 2023). When students feel supported, they are more comfortable expressing their own thoughts and ideas in class discussions, attempting challenges, and asking when they need help (Jamba, & Norbu, 2023). Higher levels of engagement and participation in classroom, lead to better developed knowledge and greater achievement by learners (Jamba & Norbu, 2023). A supportive learning environment is built using good communication.

Teamwork and group discussions contribute to making a safe learning space classroom, making it a more comfortable learning and safe environment. Moreover, by working in small groups, students are able to share their ideas more easily, improving their own communication skills.

II. Research Methodology

A mixed-method design was adopted, appropriate for examining past and present classroom practices within a social setting (Masood *et al.*, 2020). The cross-sectional approach enabled direct data collection from the target population at a specific time, allowing comprehensive analysis of classroom management practices (Adeniran, 2020). According to Adeniran, (2020), the design is a fact-finding study in which data is gathered directly from a population at a specific period. Hence this design was most suited for this study because it was carried out in a situation that necessitates direct replies from study participants while exploring existing phenomena without manipulating variables. The choice of this design enabled the researcher to collect data across the sample population using the same instruments at the same time.

III. Results and Findings

Descriptive statistics on the influence of classroom management strategies on Chemistry performance in public secondary schools

Table 1

Statement	Mean	Std Dev
Our class discipline is good	3.36	1.31
We have class communication channels	2.89	1.59
Classroom has organized learning space	3.15	1.47
Duty roster for classroom cleaning	2.83	1.53
Strict class rules have eradicated vices	2.93	1.48
There is increased instructional time	3.09	1.45
I can easily visit my Chemistry teacher	3.04	1.44

Source: Field Data, 2024

The analysis of students' perceptions regarding their classroom environment reveals that classroom discipline is generally viewed positively, with the highest mean score (3.36) and relatively low variation in responses. This suggests a well-maintained sense of order and adherence to rules among most students. Similarly, the organization of learning space and access to instructional time received moderate mean scores (3.15 and 3.09 respectively), indicating that these aspects are adequately managed, though not without room for improvement.

However, the findings also show areas of concern. Communication channels within the class recorded the lowest mean (2.89) and the highest standard deviation (1.59), indicating significant variation in experiences among students. This could point to inconsistencies in how information is shared or understood. Additionally, statements regarding the presence of a duty roster for

cleaning and the effectiveness of class rules in eliminating negative behaviors such as noise and theft were met with moderate skepticism, as reflected in their relatively low mean scores and higher standard deviations.

Overall, while students generally appreciate certain aspects of their classroom environment—particularly discipline and structure—other areas such as communication, cleanliness responsibilities, and access to academic support need further attention. The variation in responses across all statements suggests that not all students benefit equally, highlighting the need for more inclusive and consistent classroom management strategies.

Inferential Statistics

Simple Linear Regression analysis the influence of classroom management strategies on Chemistry performance in public secondary schools

The objective of the study was to examine the influence of classroom management strategies on Chemistry performance in public secondary schools in Trans Nzoia East Sub-County. A Pearson correlation analysis revealed a strong, positive, and significant relationship ($r = 0.727$, $p < .001$), indicating that classroom management strategies contribute notably to Chemistry performance.

Regression analysis results (Table 1) showed an R value of 0.623, reflecting a moderate positive relationship, while $R^2 = 0.834$ suggested that classroom management strategies explain approximately 83.4% of the variance in Chemistry performance, with an Adjusted R^2 of 0.589 indicating a good model fit.

Table 2 Analysis of ANOVA on Classroom Management Strategies

ANOVA	Sum of squares	df	Mean square	f	Sig.
Regression	45.211		45.211	43.219	0.000 ^b
Residual	17.324	19	0.512		
Total	62.535	20			

Dependent Variable: Students' Academic Performance in Chemistry

Predictors: (Constant) Classroom management strategies

Source: Field Data (2024)

This implies that the model, accounting for sample size and predictors, moderately explains student performance in Chemistry.

ANOVA results (Table 4.12) confirmed model significance, $F(1,19) = 49.589$, $p < .001$, indicating that the regression model significantly predicts Chemistry performance.

Table 3 Analysis of Classroom Management Strategies Regression Analysis

Coefficients	Unstandardized Coefficient		Standardized Coefficient	T	Sig.	95% confidence β	
Model	B	Std. Error	Beta			Lower Bound	Upper Bound
	0.651	0.633	0.234			-1.123	
Objective I	0.656704	0.341	.596	7.657	0.000	0.19	1.464

Dependent Variable: Students' Academic Performance in Chemistry

Predictors: (Constant) Classroom management strategies

Source: Field Data (2024)

The regression coefficient for classroom management strategies ($\beta = 0.6567$, $p < .001$) was also statistically significant (Table 2). This suggests that a one-unit increase in classroom management strategies results in a 0.6567 unit increase in Chemistry performance. Thus, the null hypothesis (H_{01}) was rejected.

The regression model was summarized as:

$$Y = -0.611 + 0.6567K_2 + \varepsilon$$

Where:

Y = Chemistry performance

K₂ = Classroom management strategies

These findings affirm that effective classroom management practices—including discipline, class organization, and communication—substantially enhance Chemistry performance.

IV. Discussion

The findings corroborate research by Ezike and Moyib (2021) in Ogun State, Nigeria, which identified classroom discipline and positive teacher-student relationships as strong predictors of academic success in Chemistry. Similarly, Mwangi and Mugambi (2020) in Murang'a County, Kenya, demonstrated the impact of teachers' non-verbal behaviors on Chemistry performance. Additionally, a study in Rwanda (Heliyon, 2024) emphasized active learning and group work in improving conceptual understanding, aligning with social constructivist theory. Bua and Ada (2015) also noted that effective classroom management enhances students' achievement in science subjects.

V. Conclusion:

Classroom management strategies have a significant, positive influence on Chemistry performance in public secondary schools in Trans Nzoia East Sub-County. These findings highlight the importance of structured classroom environments, positive teacher-student interactions, and active instructional practices for improving academic outcomes in Chemistry.

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