



Teacher Achievement Motivation and Students Academic Performance in Science Subjects in the Kenya Certificate of Secondary Education in Ijara Sub County, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Motivation plays a critical role in the success and profitability of an organization, particularly in shaping human capital, which is a company's most valuable asset. This study aimed to examine the relationship between teachers' achievement motivation and students' academic performance in science subjects in secondary schools within Ijara Sub-County. A survey research design was employed to gather primary data that was collected, maintained, and analyzed according to the

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study's objectives. The research targeted 4 principals, 36 teachers, and 16 students from 4 examination secondary schools in the sub-county, utilizing a census method instead of sampling. Data were collected through structured questionnaires. Both quantitative and qualitative data analyses were conducted to provide descriptive insights. Additionally, multiple linear regression analysis was performed to assess the relationship between the independent variables; working conditions, professional development, safety and security, and availability of instructional materials, and the dependent variable, which was student academic performance. The study's findings indicated that there is a statistically significant relationship between teachers' working conditions and students' academic performance in science subjects at the Kenya Certificate of Secondary Education (KCSE) level in Ijara Sub-County (p -value < 0.01 , $r = 0.762$). Teachers' professional development also showed a moderate influence on students' academic performance in science (p -value > 0.01 , $r = 0.673$). Safety and security had a moderate impact on student academic performance (p -value < 0.01 , $r = 0.626$), while instructional resources for science teaching strongly influenced students' academic performance (p -value < 0.01 , $r = 0.711$). Overall, the study concluded that all independent variables—working conditions, professional development, safety and security, and instructional resources; collectively had a significant influence on students' academic performance in science subjects at the KCSE level in Ijara Sub-County (p -value < 0.01 , $r = 0.888$).

Keywords: *Academic performance; instructional materials; professional development; science subjects; safety and security; teachers' achievement motivation; working conditions.*

1. INTRODUCTION

1.1 Background of the Study

Education plays a fundamental role in the economic development of a state by providing the necessary human capital required for the efficient and effective transformation of other resources into high-value outputs [1]. As a cornerstone of both economic and social development, education serves not only as a tool for economic growth but also as a key mechanism for individual welfare provision [2]. In pursuit of these goals, schools strive for high performance in national examinations, highlighting the importance of employee motivation, particularly among educators, in achieving these objectives [3].

Although organizations recognize the significance of motivating employees in the workplace, they often fail to fully understand the key factors driving employee motivation [4]. Scholars generally agree that rewards play a crucial role in enhancing employee productivity, though opinions differ regarding whether rewards are among the primary determinants of motivation [4,5]. Existing literature suggests that intrinsic rewards evoke positive emotional responses that motivate employees to continue improving and contribute to long-term behavioral changes when necessary [6]. For instance, when individuals complete a task successfully, they often experience a sense of accomplishment and

satisfaction. Empirical studies further demonstrate that reward practices are instrumental in enhancing employee performance and achieving organizational goals [7].

Low levels of teacher motivation are often attributed to factors such as inadequate remuneration, excessive workloads, lack of effective promotion opportunities, and negative societal perceptions [8,9,10]. Teacher motivation is crucial, as a lack of rewards can lead to diminished motivation and, in turn, negatively affect their performance [11]. Sunu and Baidoo-Anu [12] observed that declining school performance is often associated with systemic issues such as shortages in learning and teaching resources, ineffective leadership, and inadequate teacher motivation. As a result, teachers experience frustration, dissatisfaction, and a lack of inspiration, which translates into poor student outcomes, exam malpractice, and other negative behaviors.

In environments characterized by insecurity, teacher morale is notably low [13]. Workplace safety is a key determinant of employees' commitment to achieving organizational goals, as a sense of security is essential for fostering higher levels of engagement and productivity [14]. This study, therefore, focuses on the impact of teacher motivation on student performance in science subjects in the Kenya Certificate of Secondary Education (KCSE).

1.2 Statement of the Problem

There has been a persistent concern among parents regarding the low academic performance of students in science subjects within Ijara sub-county, particularly the absence of students enrolling in physics in certain schools. This issue is evidenced by the results from one secondary school over the past three years, where the mean scores for chemistry and biology ranged between 4.96 and 1.73, while the score for physics was consistently zero. Consequently, many students are unable to pursue science-related careers in higher education due to their poor performance in these subjects. Although numerous scholarly works have explored the influence of teacher motivation on student performance across all subjects, there is a notable lack of focus on science subjects within Ijara sub-county. Specifically, there has been limited research examining the relationship between teacher motivation and factors such as working conditions, professional development, insecurity, and the availability of instructional resources in relation to science subjects. Therefore, this study assesses the relationship between teachers' achievement motivation and students' academic performance in science subjects in the Kenya Certificate of Secondary Education (KCSE) within Ijara sub-county. In doing so, it contributes to the existing body of knowledge and addresses this critical research gap.

1.3 Objectives of the Study

1.3.1 General objective of the study

To investigate the relationship between teachers' achievement motivation and students' academic performance in science subjects in KCSE Ijara Sub-County.

1.3.2 Specific objectives of the study

- i. To establish relationship between working conditions of the teachers and students' academic performance in science subjects in the KCSE in Ijara sub- county secondary schools.
- ii. To examine relationship between professional development of the teachers and students' performance in science subjects in the KCSE in Ijara sub- county secondary schools.
- iii. To establish relationship between safety and security of teachers and students'

academic performance in science subjects in the KCSE in Ijara sub- county secondary schools.

- iv. To establish relationship between instructional resources available for teaching and student academic performance in science subjects in the KCSE in Ijara sub- county Secondary

2. LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Frederick Herzberg's two-factor theory

This study is anchored in Frederick Herzberg's Two-Factor Theory (1959), which posits that hygiene factors, which are extrinsic, and motivators, which are intrinsic, operate independently [15]. Herzberg's theory suggests that while motivators lead to high levels of motivation, hygiene factors, though necessary, do not inherently increase motivation but serve to reduce dissatisfaction. Motivators are tied to the nature of the work itself and encompass elements such as promotions, responsibility, achievement, and recognition. In contrast, hygiene factors, including supervision, remuneration, and working conditions, are associated with the broader work environment and help prevent dissatisfaction [16].

In the context of this theory, improvements in school performance are influenced by both intrinsic and extrinsic factors. Thus, school managers can enhance teacher motivation through the strategic use of both intrinsic rewards, such as professional recognition, and extrinsic rewards, such as better working conditions. These rewards significantly impact teachers' achievement motivation, which subsequently influences student performance. According to Herzberg's Two-Factor Theory, if school leaders fail to address the intrinsic motivators, teachers may not be motivated to perform beyond a satisfactory level, even if dissatisfaction is minimized through improved hygiene factors [17].

2.2 Vroom's Expectancy Theory

Vroom's Expectancy Theory is founded on the premise that performance is a function of both motivation and ability. It suggests that performance levels are determined by the interactive effects of ability, motivation, perceptions of pride, and personal traits [18]. The

theory assumes that behavior results from conscious choices made between alternatives, with the aim of maximizing pleasure and minimizing discomfort. Vroom posited that an individual's performance is influenced by various personal factors, including personality, skills, knowledge, experience, and abilities. The Expectancy Theory is built upon three key constructs: valence, expectancy, and instrumentality [19]. Valence refers to the emotional response towards the rewards associated with job performance. Expectancy denotes the individual's belief in the likelihood that effort will lead to a desired outcome, while instrumentality relates to the confidence that performance will be rewarded with specific benefits.

The implications of Vroom's Expectancy Theory are that employees adjust their level of effort based on the value they place on the rewards and their perceptions of the strength of the connection between effort and outcome. In the context of this study, science teachers in Ijara Sub-County are no exception; when properly motivated, they are likely to increase their effort, resulting in improved teaching performance and, consequently, better student outcomes.

2.3 Empirical Review

Empirical studies suggest that improved working conditions may positively influence teachers' morale, subsequently enhancing job performance [20]. A study by Asogwa et al. [21] in Nigeria examined the impact of principals' administrative practices designed to motivate teachers on student academic performance. The findings revealed that involving teachers in decision-making processes and providing material incentives enhanced teacher motivation, which, in turn, improved student performance. In another study, Aliwaru (2019) explored the relationship between motivational practices and lecturers' performance in tertiary institutions in Uganda, focusing on Arua District. The study showed that financial rewards were positively correlated with lecturers' performance, and the delegation of responsibilities was also linked to improved performance. Additionally, the findings indicated a positive relationship between lecturer training and performance in tertiary institutions. Motivational practices were found to account for 60% of lecturers' performance. The study concluded that the delegation of responsibilities, provision of financial rewards, and training were motivational practices that positively influenced

lecturers' performance in the district's tertiary institutions. Similarly, Kyambi et al. [22] conducted a study on the influence of pupil-teacher ratios on formative evaluation practices in Mwingi public primary schools, utilizing a descriptive survey design and questionnaires for data collection. The study found that high pupil-teacher ratios demotivated teachers, leading to lower academic performance among students.

Active involvement in professional development was shown to improve teachers' skills, knowledge, attitudes and values [23]. research by Khanal and Phyak [24] which analyzed the factors affecting motivation of teachers in Nepal using mixed method showed that school principals motivated teachers by way of good leadership provision, reduction of teaching load, granting professional development opportunities as well as feedback while in accordance with Ajayi, Onibeju and Olutayo [25], quality teachers who have content mastery, appropriate pedagogical qualifications as well as positive teaching attitude plays a substantial role as pertains to educational achievement of students. The study by Comighud and Arevalo [26] showed that commitment of teachers and engagement of students improved when the teachers attended professional courses and when they received financial incentives. In thier research, Herrmann et al. [27] assessed the effects that principals' professional development program had on instructional leadership and concluded that that program had no effect on achievement for schools. Byaruhanga [28] research on teachers' motivation in Uganda found out that teacher in-service training and workshops improved teaching effectiveness as well as student learning. However, the context of this research was elementary schools while the current study focused on secondary schools. Wambugu, et al. [29] concurred with this study by noting that dedication of teachers to their jobs and interest in students arose from recognition of their efforts using incentives and awards.

Empirical research shows that, in a school environment characterize by insecurity, the morale of teachers is low [13,14]. So, classrooms should be washed and dusted regularly for the well-being of the teachers and students. School planning should consider the requirements and types of fencing for the school. Security measures should be in place from when a visitor reaches school grounds. Cameras should be present in the parking lot, single entry ways into the building and also access-controlled

technology all of which aid in controlling activities in and also around the buildings. Whereas technology plays a vital role, devoted security workers can often avert an incident from happening initially or help avoid a situation from intensifying.

Learning involves interplay of students' motivation, physical facilities, teaching resources and skills of teaching and curriculum demands. Aseka [30] examined principal supervisory practices influence on teachers' performance. The research revealed that more than two-thirds teachers' job performance could be attributed to combination of various independent factors relating to school principals' supervision practices, classroom observation, checking teachers' professional records, provision of instructional resources, teachers' professional development as well as reward system. That study conclusion was that for a principal who constantly conducted lessons observation and held model sessions in teaching with teachers, he/she would significantly influence job performance for the teachers and consequently students' performance.

3. METHODOLOGY

3.1 Research Design

Design for research may be in several categories which are exploratory, diagnostic, descriptive and experimental [31]. The concern of descriptive research is to describe features of groups and individuals [31]. For the present study, descriptive study design was considered appropriate since this study's concern is to describe characteristics of teachers in terms of motivation and academic performance of students. The study thus employed survey research design as it provides the researcher with first hand primary data that is collected, maintained, analyzed based on the study objectives. The design also provides immediate feedback. The study collected data since it uses quantitative mode of data which takes short period of time within a given place [32]. It allows the researcher to collect and analyze data as it exists in the field without manipulating any variable. In this case the researcher therefore, used this research study because of its advantage

3.2 Target Population

The population of this study were; 4 principals, 36 science teachers and 16 class

representatives of the 4 examination secondary schools in Ijara sub-county. The researcher identified and defined an experimentally accessible population. This was a more manageable sub set or proportion of the population. The targeted teachers in the study were science subject teachers.

3.3 Sampling Technique and Sample Size

The study adopted census methods of sampling which is also known as complete enumeration or complete survey to pick all the school principals and science teachers and class representatives of the four examination secondary schools. The researcher chose this method in order to carry out intensive study of the problem under study. This method is used when the population is small as acknowledged by Krejcie and Morgan [33].

3.4 Data Collection Instruments

Structured questionnaire, interview schedule and focus groups' discussions were employed to obtain data from the respondents in the 4 examination secondary schools, Questionnaires were administered to the teachers, the interview schedules for the principals and focus group study for the students. Questionnaires are ideal for survey study and also are widely employed in education research to obtain information regarding current practices and conditions in addition to making inquiries about attitude and opinions fast and precisely. The questionnaire was presented in Likert form. The interview involved a face-to-face meeting between the researcher and the interviewee. It was based on question and answer relating to the problem under study. The researcher used this instrument of data collection to supplement the questionnaire and get clarification on important issues relevant to the study. The focus group discussion was administered to the students who were invited to discuss their opinions, thoughts and feelings in a facilitated discussion that is designed to gather helpful information.

3.5 Validity and Reliability of Research Instruments

The current study used content validity to measure the questionnaire validity. The instrument was pretested so as to enable the study improve validity. Professional groups were involved to evaluate content validity. These experts helped establish whether or not items included in the questionnaire suitably

Table 1. Reliability Results

Variable	Alpha Coefficient	Items	Comments
Working Conditions	0.826	5	Accepted
Professional Development	0.737	3	Accepted
Safety and Security	0.774	3	Accepted
Instructional Resources for Teaching Learning Science	0.832	3	Accepted

Source: Study Pilot Data, 2024

represented academic performance of students. Construct validity which concerns predictive ability of research instrument as offered by Nganga, Kosgei and Gathuthi [34], was established through clearly defining the variables, formulating hypotheses grounded on theories supporting the variables and performing hypotheses testing empirically and logically.

To establish the reliability of the questionnaire, Cronbach's alpha was used as it assesses internal consistency of an instrument by computing a comparable average for all the possible split half correlation. According to Saunders et al (2009), a Cronbach's Alpha coefficient of greater than 0.70 as one that can be considered 'acceptable' in research. This coefficient ranges from values of -1 to 1. According to some researches, however, when the alpha co-efficient value is between 0.3 and 0.7 reliability is not bad [31].

As shown in Table 1 above, all the independent variables and the dependent variable were accepted as they had their Alpha coefficients exceeding 0.7.

3.6 Data Analysis

In analyzing the data, the researcher edited and checked for legibility, consistency, comprehensibility and completeness of data. The researcher used both quantitative and qualitative data analysis. Descriptive analysis results were presented using texts and tables. Further, multiple linear regression analysis (MLRA) established the relationship existing between the independent variables; working conditions, professional development, safety and security and instructional materials available and the dependent variables (student academic performance in science subjects in KCSE). MLRA was done an attempt to establish whether a set of independent variables together predict the specified response variable. Multiple regressions comprise beyond a single predictor variable used to explain the response variable changes [31].

Predictor variables relationship with dependent variable in this study were expressed in form of multiple regression model as;

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon$$

Where;

Y=Student Academic Performance,

β_0 is the constant or Y intercept,

$\beta_1, \beta_2, \beta_3$ and β_4 are regression coefficients that show the variation expected in Y for each unit variation in X.

X_1 = Working conditions of teachers (independent variable 1)

X_2 = Professional development of teachers (independent variable 2)

X_3 = Safety and security of teachers (independent variable 3)

X_4 = Instructional resources available for teaching (independent variable 4)

ϵ = random error.

The findings of analyzed data were presented by use of tables

4. FINDINGS AND DISCUSSION

4.1 Response Rate and Demographics

The researcher distributed 36 questionnaires to 36 science teachers of the examination secondary schools in Ijara Sub-County. Of the 36 questionnaires distributed, 32 were filled and returned. This was a response rate of 88.8% which was considered good as a response rate of at least 70% according to Mugenda and Mugenda (2003) is taken to be very good.

Findings revealed that 59% of the respondents comprised of male whereas 41% were female. This was considered a fair representation of gender by the respondents. On academic qualifications, approximately two-thirds of the respondents (65.5%) held at least a bachelor's degree qualification. Therefore, these respondents were regarded as sufficiently qualified academically to perform their tasks.

Regarding respondent employer, vast majority of respondents (78.1%) were under TSC. Since terms of conditions under TSC are generally considered more favorable to the teachers than under BOM and thus the respondents could be viewed as enjoying good terms of service. For the length of service, the majority (84.4%) of the teachers have worked for more than five years thus enabling them to have the requisite experience to answer the study's questions comprehensively

4.2 Analysis

Likert scale was used to get the views of respondents regarding the items listed as components of working conditions in the questionnaire. The measures of scale included: 1-strongly disagree, 2-Disagree, 3-Agree and 4-Strongly agree. Multiple regression analysis, through SPSS software was done at 95% confidence level. where probability value (p-value) of at greater than 0.05 would lead to acceptance of Null hypothesis that there was no significant relationship whereas P-value of less than or equal to 0.05 would lead to rejection of Null hypothesis.

4.3 Working Conditions

The study sought to analyze the influence of working conditions on students' performance in

science subjects in the KCSE in Ijara sub- county secondary schools.

Among the components of working conditions as revealed by Table 2 below, inspiration of teachers by their work was rated highest (M= 3.0937), followed by teacher feeling appreciated at the school (M=2.5938), teacher being satisfied with the incentives provided by the school (M=2.5625, school environment being friendly for the teachers (M=2.5313 and then whether salary was commensurate to workload (M= 2.2188). On average, the ratings suggest a modest view of working conditions which could partly explain the low performance of students in science subjects in the KCSE in Ijara sub- county secondary schools.

The study then tested for relationship existed between working conditions of teachers and students' academic performance in science subjects in the KCSE in Ijara sub- County using regression analysis, the test being conducted through SPSS software at 95% confidence level. P-value of at least 0.05 would lead to acceptance of Null hypothesis that there exists no statistically significant relationship between working conditions of teachers and students' academic Performance in Science subjects in the KCSE in Secondary schools in Ijara sub- County whereas P-value of less than 0.05 would lead to non-acceptance of Null hypothesis. Students' academic performance in science subjects was therefore regressed on working conditions.

Table 2. Components of Working Conditions

	N	Minimum	Maximum	Mean	Std. Deviation
Work inspires me	32	1.00	4.00	3.0937	.81752
Satisfied with incentives provided	32	1.00	4.00	2.5625	.61892
Feel appreciated by my school	32	1.00	4.00	2.5938	.79755
School environment friendly to teachers	32	1.00	4.00	2.5313	.67127
Salary commensurate with work load	32	1.00	3.00	2.2188	.55267

Table 3. Working Conditions Regression Coefficients

	Coefficients ^a		T	Sig.	
	Unstandardized Coefficients	Standardized Coefficients			
	B	Std. Error	Beta		
(Constant)	2.234	0.234		9.544	0.000
Working conditions	0.573	0.089	0.762	6.441	0.000

ANOVA = 000;
R Square =0.58

a. Dependent Variable: Students Average Academic Performance

As revealed in Table 3, ANOVA results from regression of students' academic performance in science subjects on working conditions resulted in a p-value statistic = 0.000. Since the p-value generated, $0.000 < 0.05$, the study failed to accept the Null hypothesis and concluded that there existed a statistically significant relationship between working conditions of teachers and students' academic performance in science subjects in the KCSE in Ijara sub- County. Regression analysis also generated a regression coefficient between students' academic performance in science subjects and working conditions. The model intercept was 2.234 and the slope was 0.573 with p-value being .000. P-Value of 0.000 was an indicator of a significant influence of students' academic performance in science subjects by working conditions whereas the slope of 0.573 shows that a unit change in working conditions would lead to a positive 0.573 units change in students' academic performance in science subjects. Based on these results, the study concluded that there was a positive significant relationship between working conditions of teachers and students' academic performance in science subjects in the KCSE in secondary schools in Ijara sub- County.

Findings from Principals interviews on how the school ensured good working condition for the teachers reported nearly uniform results from the four principals in that the principals moderately provide incentives to the teachers, strive to provide conducive working environment and generally appreciate teachers for their hard work. The focus group study guide from students also generally agreed that working conditions in their school was satisfactory. These results findings are in agreement with Sogoni [20] who found out that improved working conditions might influence teachers' morale which in turn encourages higher job performance and also in agreement Leblebici [35] who specifies that the work place condition

determines a level of teacher's motivation, subsequent performance, productivity and creativity.

4.4 Professional Development

The study also sought to examine the influence of professional development on students' performance in science subjects in the KCSE in Ijara sub- county secondary schools. The indicators of professional development were teachers having attended workshops/Training courses while teaching at their current school, teachers being happy with their promotions, work providing teachers with the opportunity to learn and grow, teachers having control and influence over their students in the classroom and teachers having improved their performance.

Among the components of professional development as revealed by Table 4 below, teachers having attended workshops/Training courses while teaching at their current school scored the highest (M=3.3438), followed by teachers having control and influence over their students in the classroom (M=3.0313), teachers having improved their performance (M= 2.7500), teachers being happy with their promotions with a rating (M= 2.6563) and then work providing teachers with the opportunity to learn and grow which (M=2.5000). On average, the ratings suggest a modest to high view of professional development which could also partly explain the low performance of students in science subjects in the KCSE in Ijara sub- county secondary schools.

Then the study second tested the relationship between professional development of the teachers and students' performance in science subjects in the KCSE in Ijara sub- county secondary schools using regression analysis.

Table 4. Components of Professional Development

	N	Minimum	Maximum	Mean	Std. Deviation
I have attended workshops Training courses while teaching at this school	32	2.00	4.00	3.3438	.54532
I am happy with my promotions	32	2.00	4.00	2.6563	.54532
My work provides me with the opportunity to learn and grow	32	1.00	4.00	2.5000	.76200
I have control and influence over my students in the classroom	32	2.00	4.00	3.0313	.53788
I have improved my performance	32	2.00	4.00	2.7500	.50800

Table 5. Professional Development Regression Coefficients

	Coefficients ^a			T	Sig.
	Unstandardized Coefficients	Std. Error	Standardized Coefficients		
	B		Beta		
(Constant)	1.798	0.388		4.631	0.000
Professional Development	0.674	0.135	0.673	4.987	0.000

ANOVA = 000
R Square= 0.453
a. Dependent Variable: Students Average Academic Performance

Table 6. Components of Safety and Security

	N	Minimum	Maximum	Mean	Std. Deviation
Access to the school by visitors is controlled	32	2.00	4.00	3.2500	.56796
The school has proper fence and lighting	32	2.00	3.00	2.5313	.50701
There are reports of perceived terror attacks frequently	32	1.00	4.00	2.3125	.69270
Use of security cameras in the school	32	2.00	4.00	3.0938	.53033
The school has security officers	32	2.00	4.00	2.9688	.30946

Table 7. Safety and Security Regression Coefficients

	Coefficients ^a			T	Sig.
	Unstandardized Coefficients	Std. Error	Standardized Coefficients		
	B		Beta		
(Constant)	1.682	0.467		3.604	0.000
Safety and Security	0.721	0.164	0.626	4.394	0.000

ANOVA = 000
R Square= 0.392
a. Dependent Variable: Students Average Academic Performance

As revealed in Table 5, ANOVA results from regression of students' academic performance in science subjects on professional development resulted in a p-value statistic = 0.000. Since the p-value generated, $0.000 < 0.05$, the study failed to accept the Null hypothesis and concluded that there existed a statistically significant relationship between professional development of teachers and students' academic performance in science subjects in the KCSE in Ijara sub- County. Regression analysis also generated a regression coefficient between students' academic performance in science subjects and professional development. The model intercept was 1.798 and the slope was 0.674 with p-value being .000. P-Value of 0.000 was an indicator of

a significant influence of students' academic performance in science subjects by professional development whereas the slope of 0.674 shows that a unit change in professional development would lead to a positive 0.674 units change in students' academic performance in science subjects. Based on these results, the study concluded that there was a positive significant relationship between professional development of teachers and students' academic performance in science subjects in the KCSE in secondary schools in Ijara sub- County.

The results agree with those of Ajayi, Onibeju and Olutayo [25] who offered that quality teachers who have content mastery, appropriate

pedagogical qualifications as well as positive teaching attitude plays a substantial role as pertains to educational achievement of students. The findings also agree with those of Schipper, Goei and Van Veen [36] who concluded that learning progress by students is attained through competent teachers who observe, evaluate, analyze and predict the needs of students' education.

4.5 Safety and Security

The influence of teacher's safety and security on students' performance in science subjects in the KCSE in Ijara sub- county secondary schools was sought. The indicators of safety and security were that access to the school by visitors was controlled, the school had proper fence and lighting, there were reports of perceived terror attacks frequently, there was use of security cameras in the school and the school had security officers.

Among the components of safety and security as revealed by Table 6, access to the school by visitors being controlled scored the highest (M=3.2500), followed by there was use of security cameras in the school (M=3.0938), the school had security officers (M=2.9688), the school had proper fence and lighting (M=2.5313) and then there were reports of perceived terror attacks frequently rated (M=2.3125). On average, the ratings again suggest a modest view of safety and security which could also partly explain the low performance of students' in science subjects in the KCSE in Ijara sub- county secondary schools.

The study tested the relationship between safety and security and students' performance in science subjects in the KCSE in Ijara sub- county secondary schools using regression analysis.

As revealed by Table 7, ANOVA results from regression of students' academic performance in science subjects on safety and security resulted in a p-value statistic = 0.000. Since the p-value generated, $0.000 < 0.05$, the study failed to accept the Null hypothesis and concluded that there existed a statistically significant relationship between safety and security and students' academic performance in science subjects in the KCSE in Ijara sub- County. Regression analysis also generated a regression coefficient between students' academic performance in science subjects and safety and security. The model intercept was 1.682 and the slope was 0.721 with

p-value being .000. P-Value of 0.000 was an indicator of a significant influence of students' academic performance in science subjects by safety and security whereas the slope of 0.721 shows that a unit change in safety and security would lead to a positive 0.721 units change in students' academic performance in science subjects. Based on these results, the study concluded that there was a positive significant relationship between safety and security of teachers and students' academic performance in science subjects in the KCSE in secondary schools in Ijara sub- County. Teachers' safety and security was also found as having a positive and significant influence on students' performance. ANOVA test revealed a p-value statistic was 0.000. The findings agree with Mboweni and Taole [13]. Who offered that when job threat led to stressful teaching activities, this can bring about depression which in turn impedes the capacity of teacher in professional teaching and performance.

4.6 Instructional Resources for Teaching Science

The influence of instructional resources for teaching science on students' performance in science subjects in the KCSE in Ijara sub- county secondary schools was also sought. The indicators of instructional resources for teaching science were that the school had a laboratory, teachers needed more instructional resources in the laboratory, that use of resource person in the school was frequent, teachers have access to the required and quality learning tools and that teachers incorporate the use of different resources, technology or instructional materials to facilitate learning.

Among the components of instructional resources for teaching science as revealed by Table 8, that the school had a laboratory scored the highest (M= 3.3750), followed by that teachers incorporated the use of different resources, technology or instructional materials to facilitate learning (M= 3.0938), teachers having access to the required and quality learning tools (M= 2.9063), teachers needed more instructional resources in the laboratory (M= 2.6563) and last score was for frequent use of resource person in the school (M= 2.2500). On average, the ratings again suggest a modest view of instructional resources for teaching science which could also partly explain the low performance of students in science subjects in

Table 8. Components of Instructional Resources for Teaching Science

	N	Minimum	Maximum	Mean	Std. Deviation
The school has a laboratory	32	3.00	4.00	3.3750	.49187
I need more instructional resources in the laboratory	32	2.00	4.00	2.6563	.65300
Use of resource person in the school is frequent	32	1.00	3.00	2.2500	.62217
I have access to the required and quality learning tools	32	2.00	4.00	2.9063	.64053
Incorporate the use of different resources technology	32	2.00	4.00	3.0938	.46555

Table 9. Instructional Resources Regression Coefficients

	Coefficients ^a			T	Sig.
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta		
(Constant)	1.347	0.431		3.123	0.004
Instructional resources for teaching science	0.832	0.15	0.711	5.533	0

ANOVA = 000
R Square= 0.505

a. Dependent Variable: Students Average Academic Performance

Table 10. Students' Performance in Science Subjects

Subject/Year	M.Score 2023	M.Score 2022	M.Score 2021	M.Score 2020	Average
School 1	4.0	3.8	3.7	3.6	3.78
Average					
School 2	4.3	4.1	3.9	3.8	4.02
Average					
School 3	3.9	4.0	3.7	3.6	3.8
Average					
School 4	3.2	3.0	3.1	2.9	3.05
Average					

the KCSE in Ijara sub- county secondary schools.

The study tested for the relationship between instructional resources for teaching science and students' performance in science subjects in the KCSE using regression analysis.

As revealed by Table 9 above, ANOVA results from regression of students' academic performance in science subjects on instructional resources available for teaching science resulted in a p-value statistic = 0.000. Since the p-value generated, 0.000<0.05, the study failed to accept the Null hypothesis and concluded that there existed a statistically significant relationship

between instructional resources available for teaching science and students' academic performance in science subjects in the KCSE in Ijara sub- County. Regression analysis also generated a regression coefficient between students' academic performance in science subjects and instructional resources available for teaching science. The model intercept was 1.347 and the slope was 0.832 with p-value being .000. P-Value of 0.000 was an indicator of a significant influence of students' academic performance in science subjects by instructional resources available for teaching science whereas the slope of 0.832 shows that a unit change in safety and security would lead to a positive 0.832 units change in students' academic performance in

Table 11. Combined Effects of Teacher Achievement Motivation on Students’ Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.543	.382		1.421	.167
	Working conditions	.260	.095	.345	2.724	.011
	Professional development	.212	.115	.211	1.835	.078
	Safety and security	.360	.117	.312	3.074	.005
	Instructional resources for teaching science	.309	.150	.264	2.056	.050

ANOVA = 0.000

R Square = 0.788

a. Dependent Variable: Students Average Academic Performance

science subjects. Based on these results, the study concluded that there was a positive significant relationship between instructional resources available for teaching science and students’ academic performance in science subjects in the KCSE in secondary schools in Ijara sub- County. These findings are consistent with Wabuko (2016) position that schools endowed with more materials performs better other schools also with Lyons [37] who infer that learning is complex and the availability of instructional resources can motivate the teacher very much.

As per Table, 3, Table 5, Table 7, and Table 9 Coefficient of determination, R², was found to be 0.566,0.435, 0.371 and 0.489 for the four components of working conditions, professional development, safety and security and instructional resources for teaching science respectively showing that 56.6%, 43.5% and 37.1% and 48.9% of variation in students’ academic performance in science was explained by each component of the independent variable. Thus, working conditions and instructional resources for teaching science were highly correlated with students’ academic performance in science whereas professional development and safety and security were moderately correlated with students’ academic performance.

4.7 Students’ Performance in Science Subjects

Students’ performance in science subjects in the KCSE in Ijara sub- county secondary schools was examined by use of secondary data collection sheet.

As per Table 10 students’ performance in science subjects in the KCSE in Ijara sub- county

examination secondary schools was low with school 2 performance being the highest at 4.02, followed by school 3 at 3.8, school 1 at 3.78 and finally school 4 with an average performance of 3.05.

4.8 Combined Effects of Teacher Achievement Motivation on Students’ Performance in Science Subjects

The combined influence of the four predictor variables of working conditions, professional development, safety and security and instructional resources for teaching science on the dependent variable, students’ performance in science subjects in the KCSE in Ijara sub- county secondary schools was assessed.

The interpretations of findings in the above Table 11 indicated the following regression model:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Therefore;

$$Y=0.543+0.260X_1+0.212X_2+0.360X_3 + 0.309X_4 + \varepsilon$$

The beta coefficients indicate the level at which dependent variable varies with a unit variation in each of the various independent variables. According to the model, a unit variation in working conditions, professional development, safety and security and instructional resources for teaching science would leads to a 0.260, 0.212, 0.360- and 0.309-times changes in the students’ performance in science subjects respectively.

To appraise the combined influence of the independent variables on the dependent variable, multiple regression analysis was done. The analysis results indicated that 75.7% of the variance was explained by the model and thus offering the model as a significant predictor of students' performance in science subjects, $F(4,27) = 25.125$, $p\text{-value} = 0.000$. The R square adjusted value for the model is 0.757. This shows that the independent variables explain 75.7% of the changes in the dependent variable leaving 24.3% unexplained. This means that the model used was appropriate and the results indicate a strong and positive association between the dependent variable and the independent variables.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study concludes that there exists a statistically significant relationship between working conditions of teachers and students' academic performance in science subjects in the KCSE in Ijara sub- County ($p\text{-value} < 0.01$; $r=0.762$).

The study also concludes that teacher's professional development moderately influenced students' academic performance in science subjects in the KCSE in Ijara sub- County. This was evidenced by regression of Students' academic performance in science subjects on teachers professional development ($p\text{-value} > 0.01$; $r=0.673$).

Regarding safety and security of teachers, the study concluded that safety and security moderately influenced students' academic performance in science subjects in the KCSE in Ijara Sub- County. ($p\text{-value} < 0.01$; $r=0.626$).

Instructional resources for teaching science strongly influenced students' academic performance in science subjects in the KCSE in Ijara sub- County ($p\text{-value} < 0.01$; $r=0.711$).

Finally, all the independent variables; working conditions, professional development, safety and security and instructional resources jointly influence the dependent variable; students' academic performance in science subjects in the KCSE in Ijara sub- County ($p\text{ value} < 0.01$; $r=0.888$).

5.2 Recommendations

The study recommends for school management to improve working conditions of teachers especially in terms of appreciating teachers. More so, the schools' management for improved professional development especially in terms of provision of opportunity to learn and grow. The study further recommends that school management improves safety for teachers especially in terms frequent reports on perceived terror attacks which was a concern for many teachers. Finally, the study recommended that instructional resources such as frequent use of resource person in the school be enhanced by the school management.

6. SUGGESTIONS FOR FURTHER RESEARCH

The current study combined independent variables explained 75.7% of the variation in students' academic performance in science subjects in the KCSE in Ijara sub- County as per the multiple coefficients of determination, R^2 , which was 0.757. Future studies could therefore explore the other factors affecting students' academic performance in science subjects in the KCSE in Ijara sub- County other than those in the current study. Future studies can also focus on students' academic performance in science subjects in the KCSE in other localities other than Ijara sub- County.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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