

Influence of Classroom Management on Students' Academic Achievement in Sub County Public Secondary Schools in Bondo Sub County, Kenya

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ABSTRACT

School facilities not only provide the means and environment for curriculum implementation to students and school staff but also make them feel safe and motivated to learn, work or teach. A school with adequate and well-managed facilities attracts many students because it is able to meet the curriculum requirements. Globally, educational achievement has been measured by standardized scores obtained from examinations. There is a clamor for quality grades in the national examinations with parents choosing schools for their children depending on how many students the school qualified for university admission. Previous studies in other regions have linked students' academic achievement to the management of the school plant. The purpose of this study was to establish the influence of selected school plant management on students' academic achievement in the Kenya national examinations in public Sub County secondary schools in Bondo Sub-County, Kenya. This study focused on the following objectives: To assess the extent to which classroom conditions have influenced students' academic achievement in sub county public secondary schools in Bondo Sub-County. The study was guided by the Education Production Function proposed by Coleman (1966). The Mixed Method Research Design was used and the concurrent triangulation approach adopted. The study targeted all the 29 public secondary schools in Bondo Sub County from which purposive sampling was used to identify 21 Sub County public secondary schools which formed the sample size. Saturated sampling was used to identify the one Sub-County Director of Education. Document analysis of the Kenya National Examinations for the years 2023 2024, 2025 was done. Questionnaires were administered to the 21 deputy principals, An Interview Schedule was used to gather in-depth information from 1 Sub-County Director of Education and 21 principals of the schools. Validity of the instruments was determined by the supervisors and members of staff from the School of Education Humanities and Social Sciences. Quantitative data was analyzed using computer SPSS v35 and presented in frequencies, and percentages using charts and tables whereas qualitative data was thematically analyzed and presented in prose form. The study established that classroom conditions occasioned by congestion have hindered collaboration leading to low achievement scores. Overall, the study established that there is a strong influence of school plants on students' academic achievements and recommends that both the Ministry of Education and the school boards of management should support and increase funding to schools to improve the existing infrastructure in order to improve students' academic achievement in the national examinations and uplift the standards and quality of the existing school infrastructure with an aim to improve students' academic achievement. The study also recommends that the government should come up with a framework that will ensure equal distribution of students across the schools to ensure equitable classroom enrolment that averts overcrowding. A study should be conducted to establish the role of CDF in school plant development in sub county secondary schools in Bondo Sub County.

Key Words: Management Achievement, Implementation, Facilities, Examinations

Objectives of the Study

The study was guided by the following objective.

- i. To assess the extent to which classroom conditions have influenced students' academic achievement in public Sub County secondary schools in Bondo Sub-County.

Research Question

The study sought to answer the following question.

- i. How do classroom conditions influence the students' academic achievement in public Sub County secondary schools in Bondo Sub County?

Assumptions of the Study

The study made the following assumptions: That: -

- i. There is an extent to which classroom conditions influence students' academic achievement.

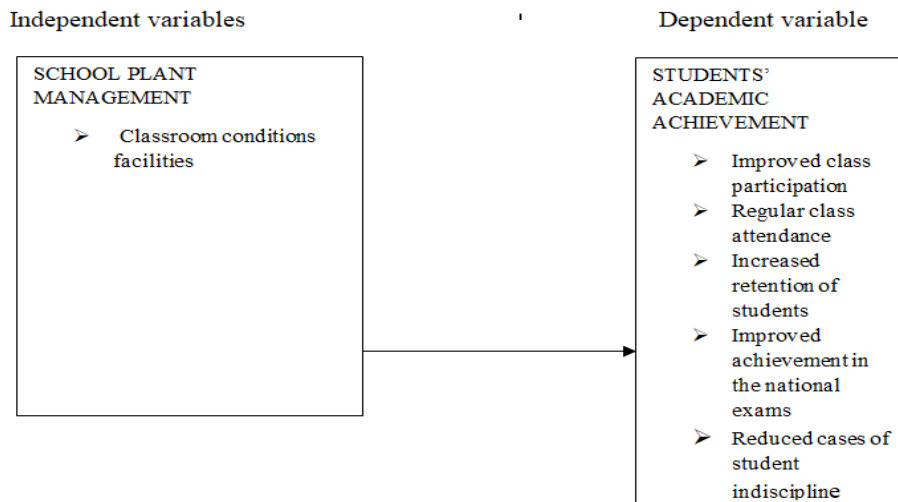
Theoretical Framework

According to Orodho (2009) a theoretical framework is made up of a theory or set of theories which form both the background and guide to the investigation in question. This study will be guided by the Educational Production Function Theory by Coleman (1966). This theory is premised on the fact that students' learning outcome (academic achievement) is impacted on by the changes in the management of the institutional resources. Coleman is of the opinion that when evaluating the overall effect of changes in assets, there is a cost benefit assessment which supports educational policy. Students' academic achievement is compared to a firm's production process in which investments are placed on the input in order to get better outputs. Bowles (2016) in concurrence with Coleman states that the educational production function gives the influence of the school and students' inputs and a measure of school output. Psacharopoulos and Patrinos (2002) noted that there are numerous benefits that one accrues in life as a result of education. This is evident in the huge budgets that nations world-wide place in the education sector. According to Hanushek & Kimko (2000) there is a strong association between what nations invest in education and their economic growth. This is corroborated by Mighir & Rivkin (2011) and Brewer & Hentschke (2010) who opine that policy makers in the 1960's lay a lot of emphasis and focussed on the relationship between the allocation of educational inputs and the multiple outcomes and that the education production function theory was designed to establish the kind of resources which make a difference for students' outcome.

In this study, the management of the classroom plant was regarded as the input while students' academic achievement in national examinations is the output. The input elements that was considered included the condition of classrooms. The management of this facility will lead to improved students' health which will in turn reduce absenteeism, meaning more study time hence improved academic achievement.

Contrastingly, another group of scholars hold different opinions. Garcia (2013) observes that the Education Production Function measures just the cognitive ability without adequately measuring the non-cognitive development which is equally crucial for wholesome development for one to function fully in the society. Bowles (1970) further observes that the home, the community, peer groups and the school are the four key educational environments that will influence student's academic achievement.

Conceptual Framework



Influence of Classroom Conditions on Students' Academic Achievement

The classroom is an integral facility in the teaching and learning process. It provides a sense of security to both the teacher and the student. Moreover, it provides shelter from adverse weather conditions such as sun, wind and rain and gives students a sense of belonging. Dudek (2000) noted that adequate classrooms are a basic requirement to access education since most learning and teaching take place in a classroom and unlike other facilities, the classroom has no alternative. Classroom conditions should enable teachers to impart knowledge effectively without distractions and the classroom climate ought to be conducive for learning (Julia, 2003). According to the researcher, these factors include and are not limited to lighting, sound-proofing, protection from rain and wind as well as the spacing of lockers, the condition of the floors, chalk wall and thermal conditions.

Frontczak & Wargock (2011) agree with Sanof (2001) in their observation that many factors may influence the academic achievement of students but the indoor environmental quality (IEQ) in classrooms can potentially influence teaching and learning positively which in turn increases the likelihood of a better academic achievement of students. Indeed, Ali, Khan and Ahmed (2020) concur with the above when they state that lighting, temperature, colour, and noise influence a student's health, sense of self safety and psychological state as well. Furthermore, highly qualified and talented teachers mostly avoid outdated and unattractive school buildings where essential facilities and resources are not available because outdated buildings and lack of resources negatively influence the quality of education, teaching-learning progress and students' academic grades.

A study by Bailey (2009) showed that when exposed to natural lighting, students progressed 20 percent on math tests and 26 per cent faster on reading tests in one year as compared to students who learned in classrooms lit by artificial lights. O'Neil and Oates (2001) in their study in Central Texas middle schools in the United States established the impact of school facilities on student achievement, behaviour, attendance, and teacher turnover. The two researchers found a positive influence between the condition of the building and students' achievement in standardized tests. The student achievement was higher in newer buildings and in buildings with higher condition ratings.

In the United States of America, a study conducted by Lackey (2001) in overcrowded schools in New York City established that students in such schools scored significantly lower on both mathematics and reading examinations than their counterparts in under-utilized schools. Furthermore, both the teachers and students affirmed that overcrowding negatively affected classroom activities and instructional techniques. It was noted by Sanof (2001) that in the United States, school conditions have led to lower students' attendance and reduced teacher and staff retention at a time when testing requirements make attendance more important than ever and retaining good teachers is viewed as a key ingredient in raising student achievement. The researcher further

believes that when school facilities are inadequate, it becomes extremely difficult for academic achievement to improve.

It has been observed that children and adolescents spend a third of their day in school. Pediatr (2005) emphasizes that the soundness of classes is of great constant concern to teachers, parents, guardians and school directors and when it is not provided, it can only destruct the role of the school and become a setback to the school's basic principles. Williams, Persuad and Turner (2008) while researching on the safety of Indian schools, established that a safe and orderly classroom environment alongside school facilities significantly relate to students' academic achievement. Furthermore, a study by the Association of School Administrators (1999) reported that in the United States, the schools in the inner cities had acute shortage of school facilities and as such the students were unlikely to perform better than their counterparts in the Suburbs if their environment was more conducive to learning; that is if the rooms were environmentally responsive to heating, air conditioning, proper ventilating systems, new or renovated school buildings and halls. An earlier study by Cash (1993) had established that students' achievement is higher up to 5% higher than their counterparts from poor schools. These studies imply therefore that school plants are crucial in improving education standards and students' academic achievement. Poorer achievement was associated with specific building condition factors such as Substandard science facilities, air conditioning, locker conditions, classroom furniture, more graffiti and noisy external environments. Willms (2000) in his study of the influence the school plant has on academic achievement in Latin America established that students who performed the least were those schooled in poor schools which lacked adequate classroom materials and library services

A study in Southern KP, Pakistan by Ali, Khan and Ahmad (2002) established that the school buildings have a high effect on the academic achievement of students in secondary school level. Both the teachers and students were of the view that students' academic achievements are highly affected and influenced due to school building either positively or negatively in that the students in well-built and up to date schools show better academic achievement as compared to the students studying in poorly constructed and low facilities buildings.

A study by Adesina (2011) in West Nigeria revealed further that instructional spaces like classroom were significantly related to students' academic achievement. It was apparent that where classrooms are properly planned in terms of location, structure and facilities, enhanced teaching and learning will take place thereby leading to better students' academic achievement. The study findings corroborate that of Agada (1994), Olusola (1989), and Umar (1976) who established that the school plant has a positive influence on students' academic achievement. These studies corroborate the study by Hamdallah, Ozevehe and Olanrewaju (2013) who established that the number of schools visited in the federal capital territory in Nigeria, exhibited classes that contained 120 – 130 pupils. The classes, chairs, desks were inadequate and teachers could not effectively manage the classes which clearly translates to poor teaching and learning environment experiences.

In Gasabo District in Rwanda, Assoumpta and Andala (2020) reveal that an earlier study had showed that students in 12 Years Basic Education increase day to day but infrastructure in those schools are not expanding proportionately. Classrooms were not enough to accommodate available students, laboratories and libraries are not equipped adequately to support students' learning and practices hence their academic achievements were negatively affected. Meanwhile, a study conducted by Hienno (2005) and Dadzie (2010) established that the uneven sharing of resources in schools in Ghana as well as the poor educational infrastructure had negatively influenced the quality of education. Additionally, a study in Uganda by Nanyonjo (2007) established that the lack facilities in secondary schools had a negative influence on the achievement of students in languages adding that there is a strong and positive relationship between students' academic achievement in Mathematics and the school physical facilities.

Mokaya, in his study on how school infrastructure influences student academic achievement in Kajiado, Kenya, established that poor class spacing was associated with poor academic achievement while good spacing was associated with good achievement. The findings concur with Dudek (2000) who observed that uncomfortable and unsuitable classrooms cause problems such as poor concentration span, writing difficulties and illness related to congestion thus reduced learning opportunities. Poor syllabus coverage, unqualified teachers, overcrowded and non-equipped classrooms and laboratories were identified as some of the causes of poor achievement in biology in central division of Machakos County Kenya (Ngesu 2014).

Mokaya's study was focussed on how school infrastructure influences students' academic achievement in Kajiado County unlike this study which will focus on classroom management and how it influences students' achievement in Bondo Sub - County.

RESEARCH METHODOLOGY

Introduction

This study seeks to establish the influence of school plant management on students' academic achievement in public secondary schools in Bondo Sub-County. The chapter will cover the research design, the target population, the sample size and sample population, the data collection techniques, validity of the data collection instruments, reliability of instruments, the data collection procedures, data analysis techniques, and ethical considerations.

Research Design

Research design is the outline, plan or scheme that is used to generate answers to the research problem. It is basically the plan and structure of investigation. According to Oso and Onen (2008), a research design is an overall plan or strategy for conducting the research. The study will employ the mixed method design and adopt the concurrent triangulation approach. According to Creswell (2014), this method involves the use of separate quantitative and qualitative methods as a means to dilute the weaknesses associated with one of the methods with the strength of the other method just as much as the strength of one method is used to strengthen the other. The researcher adds that the mixing of both is done at the interpretation and/or discussion of the data collected with a view to merge the data for comparison or integrate the two results to support or disconfirm the quantitative results. Creswell & Clark (2007) re-affirm that the mixed method approach is more than collecting and analyzing both quantitative and qualitative as it uses both in tandem in order that the overall strength of the study is greater than the single use of either.

This method will be appropriate for this study because the two methods will complement each other and reduce the limitations that may be associated with either. According to Foroudi, Palazzo & Stone (2022), using the mixed method research design helps the researcher to explore the divergent dimensions of a problem that a single method alone may miss. This is in concurrence with the observation of Creswell, Clark, Gutman & Hanson (2003) who opine that by using this method, the integration of qualitative and quantitative data at different stages is important to enhance validity.

Target Population

Orodho (2009) defines the target population as the items or individuals under consideration in a given study. Schools are stratified as National, Extra -County, County and Sub County schools. Bondo Sub County has 3 National schools, 2 Extra- County schools, 3 County schools and 21 Sub County schools. This study will therefore focus on Sub County schools only since they have performed dismally. The study will target the 34 Deputy Principals, 29 Principals of public secondary schools and 1 Sub-County Director of Education in Bondo Sub County.

Sample Population and Sampling Procedure

According to Oso and Onen (2014) a sample is part of the target population that has been procedurally selected to represent it. Review of related literature show that Sub County schools have performed poorly in national examinations as depicted in Figure 1. Purposive sampling will be used to draw a sample for this study. Bondo Sub County has 21 public Sub County schools which will participate in the study out of the 29 public secondary schools. In each school, the researcher will seek information from the 21 principals since they are ones tasked with the managing of the school plants, is a member of the School Infrastructure Committee (SIC) and the manager of Maintenance and Improvement Funds (MIF) disbursed to schools for the maintenance of the school facilities. 21 Deputy Principals will participate in this study since they are the secretaries of the SIC. The Sub-County has one Quality Assurance and Standards Officer who will participate in this study because the officer

is a mandatory member of SIC and attends all the schools' infrastructure committee meetings and regularly visits the schools to conduct random and organised assessment of the school facilities. The sample population in the study is presented in the table 3.1 below.

10% of the sample population should be used in a pilot study according to Creswell (2008). Therefore, for this study, 2 schools were drawn from the 21 Sub County schools. This comprised 9.523% of the sample population. The two schools that participated in the pilot study, were exempted from the main study and the responses obtained from them were used to improve the research instruments.

Table 4 Sample Population

No.	Respondents	Population size	Sample size	Percentage
		(N)	(n)	
1.	Principals	29	21	72.41
1.	Deputy Principals	34	21	72.41
	TOTAL	63	42	66.67

(Where: N = population size, n = sample size)

Data Collection Instruments

Instrumentation refers to the tools that was used for collecting the data. This study used the following instruments to collect the data.

Questionnaires

According to Oso and Onen (2008) a questionnaire is a collection of items to which a respondent is expected to react to in writing. Questionnaires were used to collect information from the deputy principal, the boarding masters/mistresses and the heads of department of sciences and technical and applied departments. The questionnaire contained both open and closed ended questions.

This tool was appropriate because the population is literate and it can help collect a lot of information in a short time. Furthermore, it is a cost- effective method of collecting a lot of information from a large population. The following questionnaires were used to collect data on the influence of school plant management on students' academic achievement.

The Deputy Principals' Questionnaire – Appendix 3

This questionnaire was designed for the Deputy Principals because they are the monitors of curriculum implementation. They are also the secretary to the SIC committee and because they are administrators, they are privy to the day to day running and routine of the school.

The questionnaire was divided into 3 parts. Part A gathered general information about the school. Part B gathered information on classroom conditions that influence students' academic achievement. It contained 13 statements to be rated using a 5-point Likert Scale. Part C contains 7 open-ended questions which assisted the researcher to collect in-depth information.

Validity of Data Collection Instruments

Oso and Onen (2014) state that validity is the extent to which research results can be accurately interpreted and generalised into other populations and measure what they are intended to measure. The study employed the following:

Construct Validity

Construct validity measures what the calculated scores mean and if they can be generalised. According to Borg and Gall (1989), the validity of data collection instruments is obtained through expert judgement. Assistance was sought from the supervisors in the school of Education, Postgraduate studies to help improve the quality of the data collection instruments. Ambiguous and inadequate test items eliminated or re-structured. According to Clark & Watson (2024), for a researcher to achieve construct validity, the scale must correlate strongly with existing tools measuring the same or highly similar concepts and show minimal to zero correlation with measures of distinct concepts to prevent relabelling.

Content Validity

Content validity measures the extent to which the test items accurately represent the information that is being assessed and measures the content they are designed to measure (Oso and Onen 2014). A pilot study will be used to test the validity of the questionnaires. The questionnaire was administered to 2 deputy principals; their responses were used to identify the defective items. The items were corrected, and the ambiguous ones were re-written with clarity while those that were redundant removed.

In this study, validity was established to ensure that the questionnaire and interview schedule adequately captured information on the influence of school facilities namely classrooms on students' academic achievement in public Sub-County secondary schools in Bondo Sub-County. Content validity was specifically assessed using the Content Validity Index (CVI), based on expert evaluation of the relevance and representativeness of the items in relation to the study objectives.

The findings are presented in table 6 below;

Table 6: Content Validity

Section	Number of Items	Relevant Items	CVI
Classroom Conditions	8	7	0.88

Reliability of Data Collection Instruments

According to Fairchild (2002) reliability is the extent to which the test instruments yield the same results over multiple trials. The reliability of the data collection instruments will be ascertained through a pilot study. The responses obtained from the pilot schools were used to refine the final questionnaires. The test-retest method was used to ascertain the reliability. According to Taber (2013), a score of 0.7 or higher obtained was considered as a higher degree of consistency.

In this study as shown in the table below, reliability was assessed using Cronbach's Alpha coefficient, which measures the internal consistency of items within each section of the questionnaire. A pilot study was conducted to test the reliability of the instrument before the main data collection.

Table 7: Assessment of Reliability

Section	Number of Items	Cronbach Alpha
Classroom Conditions	8	0.81

Data Collection Procedure

Permission was sought from the Board of Postgraduate Studies of Jaramogi Oginga Odinga University of Science and Technology. The letter obtained was presented to the National Commission for Science Technology and Innovation (NACOSTI). Thereafter, the researcher proceeded for field study. A pre-visit was undertaken for

familiarization purposes and booking of appointments. On the second visit, the permission was sought from the Principal and once granted, the questionnaires were issued to the respondents who were also explained to the purpose of the visit. Furthermore, appointments for interviews were also be booked. During the third visit, the filled-in questionnaires were collected and interviews done. In the event that some respondents were unavailable, new appointments were booked. The data collection period took three months.

Data Analysis Techniques

Data analysis entails the separation of data into constituent parts in order to distinguish each component separately and how it relates to the entire research. This research collected both qualitative and quantitative data which were analysed separately as follows:

Quantitative Data Analysis Technique

The data collected was checked for missing values and any inconsistencies. They were then fed into the Statistical Packages for Social Science (SPSS) v30 for analysis. Quantitative data was then descriptively analysed using measures of central tendency and presented using frequencies, percentages. The results were presented using tables and charts. Quantitative data was collected from the questionnaires. According to Cresswell (2008) quantitative data analysis is a means of testing the objectives by examining the relationship that exists among the variables so that numerical data can be analysed using statistical procedures.

Table 8 Operationalization of Variables

No.	Objective	Variable	Indicators	Measurement Scale	Research Approach	Tools Of Analysis
1.	How do classrooms conditions affect students' academic achievement	Independent variable Classroom Dependent variable Student academic achievement	Classroom conditions	Ordinal Nominal	Descriptive	Central Tendency frequencies Percentages Standard Deviations

Ethical Considerations

According to Cohen, Manion & Morrison (2007) the research process should have moral integrity in order to ensure a trustworthy process that results in valid research findings. According to Cresswell (2009), it is important to gain permission from the gatekeepers to provide access to study participants in research sites. The researcher adds that this can be done by writing a letter which is proof of identification stating clearly the impact the outcomes and extent of the research.

In order to obtain this, a written consent was obtained from the School of Postgraduate Studies Jaramogi Oginga Odinga University. A letter authorizing the research was sought from the NACOSTI. Respondents were assured of confidentiality and the purpose of the study well explained. The respondents were given the freedom to participate or decline participating in the study and neither their names nor the names of the participating institutions included in the questionnaire. The respondents were assured that a copy of the final thesis document would be made available should they request for it.

Presentation Analysis And Interpretation Of Findings

Influence of Classroom Conditions on Students' Academic Achievement

This section presents data that was collected from the Deputy Principals on how classroom conditions influence students' academic achievement in public Sub County secondary schools in Bondo Sub County. It sought to answer the research question:

“How do classroom Conditions influence the students' Academic Achievement in Public Sub County Secondary Schools in Bondo Sub County?”

The researcher sought to find out how public sub county secondary schools have performed in the national examinations in the years 2023, 2024, and 2025 in terms of the school type. Figure 5 below presents the KCSE mean performance of public Sub-County secondary schools in Bondo Sub-County disaggregated by the nature of the school, namely girls' boarding schools, mixed day schools, and mixed day and boarding schools, over the period 2023 to 2025. The figure provides a comparative overview of academic performance trends across different school settings, which differ in terms of classroom use patterns, learner contact time, congestion levels, and overall learning environment.

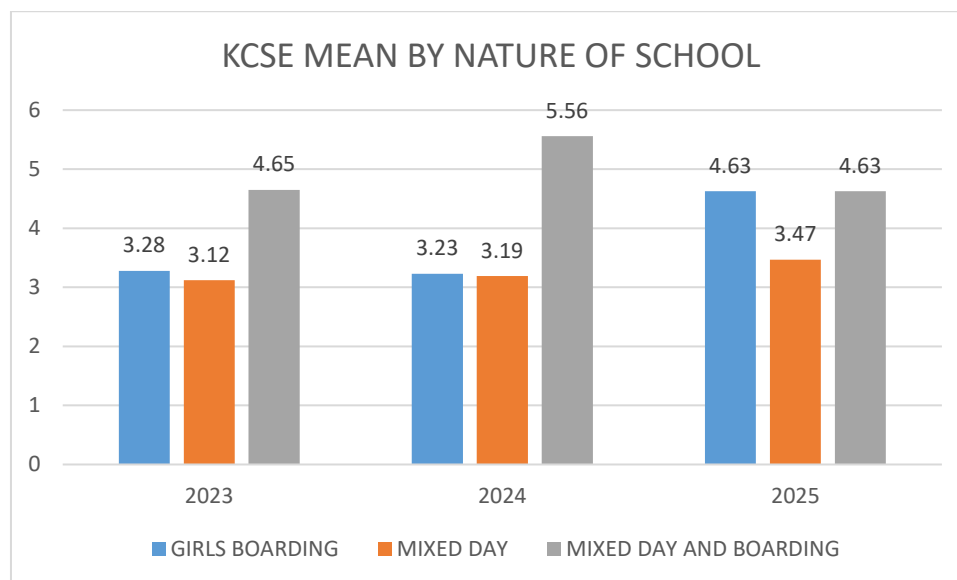


Figure 5: Trend in KCSE Mean Scores by School Nature (2023–2025)

As shown in Figure 5 KCSE mean performance varies noticeably across the three categories of schools over the three-year period under review. The results indicate that KCSE mean performance varies noticeably across the different school categories. Mixed day and boarding schools consistently recorded higher KCSE mean scores compared to girls' boarding schools and mixed day schools. Specifically, mixed day and boarding schools achieved mean scores of 4.65 in 2023, 5.56 in 2024, and 4.63 in 2025, demonstrating relatively strong performance throughout the study period. Although there was a slight decline between 2023 and 2024, the overall trend suggests that schools operating both day and boarding programs may benefit from flexible learning arrangements and extended academic engagement, which can positively influence student performance.

Girls' boarding schools recorded moderate performance levels, with KCSE mean scores of 3.28 in 2023, 3.22 in 2024 and 4.63 in 2025. The noticeable improvement in 2025 suggests a positive shift in academic outcomes. This improvement may be attributed to factors commonly associated with boarding school environments, such as better supervision of learners, structured study schedules, reduced absenteeism, and increased learning time. These findings are consistent with the observations of Hamad and Ismail (2024), who argue that structured residential learning environments can enhance students' academic engagement and concentration, thereby improving academic outcomes.

In contrast, mixed day schools recorded the lowest KCSE mean performance across the three years under review. The mean scores were 3.12 in 2023, 3.19 in 2024, and 3.47 in 2025. Although a gradual improvement is evident, the performance of mixed day schools remained consistently lower compared to the other categories. This comparatively lower performance may be attributed to challenges frequently associated with day schooling, including limited instructional time, learner fatigue due to commuting, inadequate supervision after school hours, and overcrowded learning environments. Such factors may hinder effective academic engagement and continuity of learning (Permana et al., 2024).

The results indicate variations in KCSE mean performance across school types. Mixed day and boarding schools consistently recorded higher mean scores compared to girls' boarding and mixed day schools. This suggests that combined learning environments may provide extended academic engagement and improved supervision.

The researcher aimed to examine how the number of teachers in a school relates to KCSE mean performance in public Sub-County secondary schools in Bondo Sub-County. Teacher availability is an important educational resource because it influences instructional quality, subject coverage, teacher workload, and the level of academic support provided to learners. Figure 6 therefore presents the KCSE mean performance of the sampled schools categorized by the number of teachers in each institution over the period 2023 to 2025.

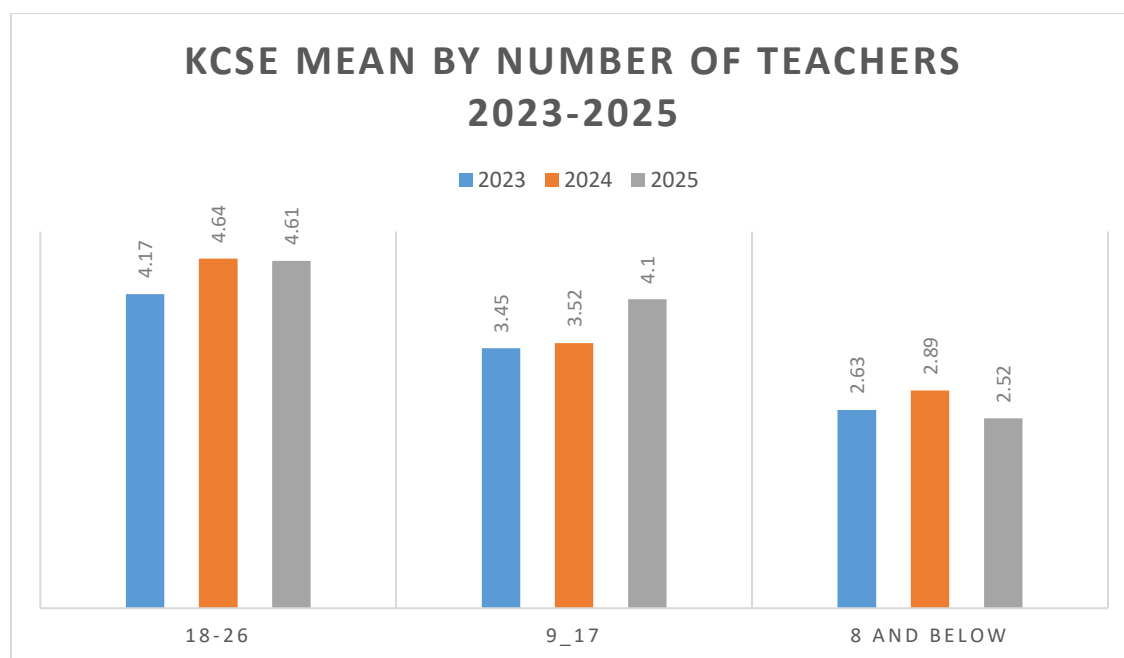


Figure 6: KCSE Mean Performance by Number of Teachers

As illustrated in Figure 4.2, KCSE mean performance generally increases with the number of teachers available in a school. The results indicate a positive relationship between the number of teachers and KCSE academic performance. Schools with 18–26 teachers consistently recorded the highest KCSE mean scores across the three years under review. Specifically, these schools attained mean scores of 4.17 in 2023, 4.64 in 2024, and 4.61 in 2025 demonstrating relatively strong and stable academic performance. The findings suggest that schools with higher teacher staffing levels are better positioned to support effective teaching and learning processes. Adequate staffing enables teachers to specialize in their respective subjects, improves lesson preparation and delivery, and facilitates closer academic supervision of learners.

Schools with 9–17 teachers recorded moderate KCSE performance, with mean scores of 3.45 in 2023, 3.52 in 2024, and 4.10 in 2025. Although this category shows noticeable improvement in 2025, the performance remains lower than that of schools with a higher number of teachers. This trend suggests that while moderate staffing levels may support the delivery of curriculum content, they may still present challenges related to teacher workload, subject coverage, and limited time for individualized learner support.

In contrast, schools with eight teachers and below recorded the lowest KCSE mean scores throughout the three-year period, with mean scores of 2.63 in 2023, 2.89 in 2024, and 2.52 in 2025. The persistently low performance in this category highlights the significant academic challenges faced by understaffed schools. Such schools are often characterized by increased teacher workload, limited subject specialization, inadequate instructional time, and difficulties in managing large classes effectively. These challenges can hinder the quality of instruction and ultimately affect students' academic achievement.

Interview responses from principals further supported these findings.

Principal 5 had this to say:

'The low numbers of teachers in my school correspondingly affect teacher performance in class which equally affect the student's academic outcome. This so because teachers handle a huge workload which affect their performance' (P1).

Principal 15 corroborated the principal 5 by saying;

'The KCSE mean of this school has gone down. This majorly because my teachers are really overworking. There are two teachers who retired from this school and have not been replaced and two went on transfer. This leaves the school with a huge gap affecting the delivery because the teachers who are around must now teach extra lessons affecting their delivery' (P4).

Principal 3 supported the above by saying;

'Shortage of teachers affects one on one interactions with students. This is because one teacher handles so many students and that limits the teacher from getting ample time to give the learners individualized attention.' (P3)

The findings are consistent with the observations of Sixbert and Onyango (2022), who argue that adequate teacher staffing enhances effective curriculum implementation and improves learner outcomes. Similarly, Hanushek (2011) notes that teacher availability is a key educational input that significantly influences student performance by enabling improved instructional quality and classroom management. Ali, Khan & Ahmed observe that teachers avoid outdated and unattractive schools where essential facilities and resources are unavailable and lack resources which may influence the quality of education, teaching and learning progress and students' academic achievements.

These findings suggest that teacher availability plays a significant supportive role in determining how effectively classroom environments are utilized. Adequate staffing enhances lesson delivery, reduces congestion in classrooms through better class allocation, and allows teachers to provide closer academic support to learners, thereby improving academic outcomes. The respondents' views agree with the findings of Attah & Adebayo (2018) who discovered that there a negative correlation between teachers' huge workload and students' performance in academics. Furthermore, Johnson (2011) states that in schools with smaller student-teacher ratio, teachers can have more time to spend with each student and check the progress of every student they are responsible for and can provide a more individualized teaching that is more suitable to each student. In congruence, Ngesu (2014) established that the performance of biology as a subject was poor in secondary schools in Machakos County due to unqualified teachers as well as poor syllabus coverage among other factors.

The researcher sought to determine the types of classroom floor and roof materials used in public Sub-County secondary schools in Bondo Sub-County as indicators of the physical learning environment. Classroom construction materials play an important role in shaping the quality of learning environments because they influence cleanliness, safety from the vagaries of the weather, durability, noise proofing, thermal comfort, and the overall conduciveness of classrooms for effective teaching and learning. Table 9 therefore presents the distribution of classroom floor and roof materials used in the sampled schools.

Table 9: Distribution of Classroom Floor and Roof Materials in Public Sub-County Secondary Schools

Specific Area	Material	Frequency	Percent (%)
Floor	Cement	9	45
	Tile	11	55
Roof	Iron Sheets	20	100
	Asbestos	0	0

The findings indicate that classroom floor materials in the sampled schools are predominantly tile (55%), while cement floors account for 45% of the classrooms. The relatively higher proportion of tiled floors suggests that a majority of schools have adopted improved classroom finishing standards, which may enhance the overall learning environment. Tiled floors are generally easier to clean, more durable, and less prone to dust accumulation compared to cement floors. Such conditions can promote better classroom hygiene, improved air quality, and greater learner comfort, which are essential for sustained concentration and effective participation during lessons. Cement floors, however, are more susceptible to dust accumulation, surface wear, and poor finishing, particularly in overcrowded classrooms where maintenance may be limited.

However, the presence of a substantial proportion of classrooms with cement floors (45%) indicates that some schools may still be operating under relatively less optimal classroom conditions.

Principal 13 however decried the lack of funds as a major hindrance to floor maintenance by saying that:

“In some cases, maintenance is delayed due to limited funds, leading to worn-out furniture and poorly ventilated classrooms. Such conditions make it difficult for students to concentrate, and teachers also find it challenging to deliver lessons effectively.”

Principal 17 had this to say:

“Regular maintenance of classrooms, such as repairing broken desks, repainting walls, and ensuring proper ventilation, helps create a conducive learning environment. When classrooms are well maintained, students are more comfortable and attentive during lessons.”

The above sentiments are in congruence with those of Meo (2004), who posits that poor physical classroom conditions can negatively affect students’ health, comfort, and concentration, thereby hindering effective learning and academic performance. Furthermore, Similar observations have been made by Dar and Bhat (2024), who argue that well-maintained classroom environments contribute significantly to students’ comfort and engagement during the learning process.

With regard to roofing materials, the findings show that all classrooms (100%) are roofed with iron sheets, while none use asbestos roofing materials. The exclusive use of iron sheet roofing reflects a level of compliance with modern safety and health standards, especially considering the well-documented health risks associated with asbestos. Iron sheet roofing is widely used in school infrastructure due to its affordability, durability, and ease of installation, and it is considered safer than asbestos-based materials (ACME, 2019).

The findings suggest that while roofing materials across schools are standardized and safe, variations in floor materials point to disparities in classroom quality. Classrooms with better-quality flooring are more likely to provide a cleaner and more comfortable learning environment, which may positively influence students’ concentration, attendance, and ultimately academic performance in national examinations. This is corroborated by a peer reviewed study by the University of Salford which established that flooring is part of the classroom ecosystem which impacts a students’ academic achievement by up to 25 percent in a school year amongst other classroom factors (Barret, Zhang, Davies &Barrett 2015).

Additionally, the views of the principals during oral interviews confirmed that classroom floor conditions significantly influence the conduciveness of the learning environment and, consequently, students' academic performance. Flooring material by extension affect the Indoor Air Quality. Classrooms with cracks on the floor and trap dust which may lead to students developing respiratory illnesses that lead to absenteeism. (World Green Building Council, 2022).

Principal five had this to say;

"Some of the classrooms have cement floors which require a lot of maintenance.

When students move lockers and chairs, cracks form which lead to holes in the floors.

At the end of every term usually one or two classes require urgent repair which is costly.

Because repairs can only be done when schools are closed, the floors generate a lot of dust and the students have to sprinkle water every morning during cleaning. This process takes a lot of time and eats into the first lesson."(p8)

Principal 8 added that;

"we receive funding from the government called the MIF. This amount helps us to do some repairs but the amount allocated for each student is too little and so we cannot do major repairs. The money is sent in tranches but it is never enough. If you wait for it to come in whole, other pressing needs may arise and you are likely to find yourself using up all the amount before doing repairs. In short, I only do minor repairs."

The sub County director reiterated that;

"the school principals are expected to use the MIF for maintenance purposes. The principals have complained that there are a lot of restrictions placed on how the MIF amount can be spent and that the amount sent termly cannot allow them to do major improvements. Schools that have fewer students are the most affected. This is because, the lower the school population, the lower the amount sent."

This response highlights that cement flooring contributes to dust accumulation, which not only affects classroom cleanliness but also disrupts lesson routines and reduces effective instructional time. Such conditions may negatively impact students' concentration, health, and overall engagement in classroom activities. These findings support the argument by Riaz Meo (2004), who established that poor physical classroom environments, including dusty and poorly maintained floors, can adversely affect students' health, comfort, and academic performance.

Overall, the findings suggest that although roofing materials across the schools are uniform and compliant with safety standards, variations in classroom floor materials reveal differences in classroom infrastructure quality among schools. Classrooms with improved flooring materials are likely to provide cleaner, safer, and more comfortable learning environments, which can positively influence students' concentration, classroom participation, and regular attendance. Consequently, improvements in classroom infrastructure may indirectly contribute to enhanced academic performance in national examinations.

The researcher sought to establish the nature of classroom maintenance practices and environmental conditions in public Sub-County secondary schools in Bondo Sub-County. In particular, the researcher aimed to determine how selected classroom environmental factors contribute to the conduciveness of the learning environment and potentially influence students' academic performance. Table 10 presents descriptive statistics on classroom maintenance practices and selected environmental conditions in public Sub-County secondary schools in Bondo Sub-County.

Table 10 Classroom Maintenance Practices and Environmental Conditions in Public Sub-County Secondary Schools

No	Element	Specific Type	Frequency	Percentage (%)
1	Mopping the classrooms	Daily	8	40
		Weekly	12	60
2	Source of lighting	Electricity	20	100
		Solar Energy	0	0
		Natural lighting	0	0
		generator	0	0
3	What type of lighting does the school use	Incandescent lighting	0	0
		Fluorescent cold	20	100
		Fluorescent hot	0	0
4	Is the school near to a highway?	Yes	16	80
		No	4	20
5	Are classrooms fitted with ceiling boards	Yes	0	0
		No	20	100

With regard to classroom cleanliness, the findings indicate that 60% of the schools mop classrooms on a weekly basis, while 40% conduct daily mopping. Although weekly cleaning may maintain basic hygiene standards, it may be insufficient in highly congested classrooms where dust accumulation occurs rapidly. Inadequate cleaning practices may result in dusty and unhygienic classroom environments that can negatively affect students' health, comfort, and concentration during lessons. According to Dar and Bhat (2024), maintaining high levels of classroom hygiene is essential for creating conducive learning environments that support student engagement and effective participation in instructional activities.

Regarding the source of classroom lighting, all the schools (100%) reported relying on electricity as the primary source of lighting. None of the schools reported the use of solar energy, generators, or natural lighting as alternative sources. While electricity provides reliable illumination under normal conditions, dependence on a single energy source may expose schools to disruptions during power outages. Such interruptions can negatively affect instructional continuity, particularly during poorly lit periods or in classrooms with limited natural light.

On the challenges affecting the classes, **Principal 13 said:**

“we had a generator but it broke down. When it was taken for repairs, the quotation given for repair was exorbitantly high and that is why we are still relying on electricity. Whenever electricity goes off students use their own solar torches which we allow them to carry to school. We are also planning to solarise the school as important school functions always stop when there is no power. we cannot produce exams and teachers cannot use the computer to type or print the exams.”

To re affirm the sentiments of the principal, **the SCDE said,**

“actually, our office recommends that schools must have an alternative source of electricity and power. And the school principals should make it a priority to have back up plans in case the electricity goes out during the night. Not just for educational purposes but also for security reasons. Learning in all the schools should not be interrupted for whatever reason. The schools have been asked to partner with financial institutions to solarise the schools. This is to help them lower the cost of electricity and also to ensure their operations do not stall.”

He added that,

“it is pointless for students who are in boarding schools not to maximise the time they have in school because of electricity and the school principals are strongly urged to ensure that the students in boarding have uninterrupted lighting especially for dawns and evening preps to be maximally utilised and to forestall any disruptive activities that can arise because of blackouts.”

In terms of the type of lighting used in classrooms, all the schools (100%) reported using fluorescent cold lighting, while none used incandescent or fluorescent hot lighting. Fluorescent cold lighting is widely preferred in educational settings due to its energy efficiency, durability, and ability to provide consistent illumination. Proper lighting conditions enhance visual comfort and reduce eye strain among learners, thereby supporting sustained attention and improved academic engagement. Studies in The Capistrano Unified District in Orange County by Hale (2002) established that students in classrooms with natural lighting, large and well-designed skylights performed 19 – 26 percent better than their peers in classrooms without these features. Similar findings have been reported by Aghajari and Chen (2025), who emphasize that appropriate classroom lighting conditions contribute positively to students’ learning efficiency and overall classroom productivity. The study established that none 0 percent of the schools relied on natural lighting. Contrastingly, a study by Bailey (2009) revealed that when students are exposed to natural lighting, they progressed 20 percent on math tests and 26 percent on reading as compared to students who were exposed to artificial lights.

On the choice of lighting and why the fluorescent was the most preferable, **Principal 9 had this to say:**

“fluorescent cold lighting is the most ideal. Our school is partially day. Whenever we were using bulbs, the students would just carry them home evening and the few who are in boarding would suffer at night. I had to do a total overhaul by replacing the bulbs with the tubes and since then the maintenance cost is low. Furthermore, the classes don’t get hot which will make them uncomfortable. The tubes create a cool environment and also have a good illumination.”

The findings further reveal that 80% of the schools are located near major highways, while only 20% are situated away from such locations. Proximity to highways may expose classrooms to external noise pollution, which can interfere with effective lesson delivery and reduce students’ concentration levels. Excessive environmental noise has been shown to negatively affect students’ cognitive processing and classroom interaction, particularly in environments where sound insulation measures are limited. According to Bluysen (2016), external noise emanating from traffic, airplanes and children playing nearby is a major problem that affects academic progress that cannot be equated to noise from within the classroom.

Finally, the results indicate that none of the classrooms (100%) are fitted with ceiling boards. The absence of ceiling boards may contribute to poor acoustic quality, excessive heat accumulation, and reduced thermal comfort within classrooms. According to Laterite and Fab Inc. (2024), ceiling boards play an important role in regulating classroom temperature, improving sound insulation, and enhancing the overall learning environment. Without such structures, classrooms may become excessively hot or noisy, especially during warm weather conditions, which can negatively affect students’ attentiveness and learning efficiency.

Overall, the findings suggest that although the schools have access to electricity and standardized lighting systems, several environmental factors continue to affect classroom conditions. These include infrequent cleaning practices, exposure to external noise from nearby highways, and the absence of ceiling boards, all of which may reduce the conduciveness of the learning environment. Consequently, such environmental limitations may restrict students’ ability to fully benefit from instructional time, thereby potentially constraining academic achievement in national examinations. This is in agreement with the observation of Frontczak & Wargock (2011)

that even though many factors influence academic achievement but the indoor air quality can positively influence teaching and learning which in turn influence better academic outcomes. Similarly, Ali, Khan and Ahmed (2020) concur that lighting, temperature, color, and noise influence not only a students' health but also inspire academic potentials.

Additionally, the views of the principals during oral interviews confirmed that classroom maintenance practices and environmental conditions play a critical role in shaping the effectiveness of the learning environment and students' academic achievement.

Principal 2 said that:

“Regular maintenance of classrooms, such as repairing broken desks, repainting walls, and ensuring proper ventilation, helps create a conducive learning environment. When classrooms are well maintained, students are more comfortable and attentive during lessons.”

In concurrence, Principal 10 said that;

“In some cases, maintenance is delayed due to limited funds, leading to worn-out furniture and poorly ventilated classrooms. Such conditions make it difficult for students to concentrate, and teachers also find it challenging to deliver lessons effectively.”

Principal 1 had this to say:

“one of the major distractors is the location of the school. The school is surrounded by homesteads. This has been a major distractor to the learning process. Whenever there is a community function such as funeral, learning is disrupted. The hooting of motorcycles and the vehicles together with the noise from the village seriously distracts our learners. Whenever a teacher is not in, sometimes, you will find our students hanging around the fence which is equally disallowed in our school as it makes it easier for them to sneak in items that are contraband.”

These findings reinforce the earlier quantitative results, which highlighted variations in classroom conditions across schools, and demonstrate that maintenance practices are a key determinant of the quality of the physical learning environment. The results are consistent with the findings of Glen Earthman (2004), who established that well-maintained school facilities are positively associated with improved student achievement, while poorly maintained environments hinder effective learning.

The researcher examined the duration since the last classroom renovation in public Sub-County secondary schools in Bondo Sub-County in order to assess the condition of classroom infrastructure. Table 11 therefore presents the distribution of the time period since classrooms were last renovated in the sampled schools.

Table 11 Duration Since Last Classroom Renovation in Public Sub-County Secondary Schools

Duration	Frequency	Percentage (%)
Between 4-9 years ago	9	45.0
Less than 3 years ago	11	55.5

The findings indicate that 55.0% of schools renovated classrooms less than three years ago, while 45.0% reported renovations between four and nine years ago. The relatively high proportion of schools with recent renovations suggests that school management and other stakeholders have made notable efforts in the recent past to improve classroom infrastructure and learning environments. Such improvements may include repainting classrooms, repairing floors, replacing broken windows, improving classroom fittings, and enhancing overall classroom aesthetics.

This was supported by principal 12 who pointed out that:

“Renovation of classrooms, such as replacing old floors, repainting walls, and improving lighting, has made a big difference in our school. Students are now more comfortable, and their concentration during lessons has improved significantly.”

Principal 4 noted that renovations are significant to students’ achievement by saying that:

“Before renovation, some classrooms were in poor condition, with cracked floors and inadequate lighting, which distracted students during lessons. After renovation, the environment became more conducive, and we have observed improvement in students’ participation and performance.”

The response by the principals are in agreement with Guard (2024), who noted that regular maintenance and renovation of educational facilities are essential for ensuring that school infrastructure remains functional, safe, and supportive of effective teaching and learning processes. Indeed, O’Neil and Oats (2001) established that there is a positive influence between newer buildings and students’ achievements. The researchers noted that students’ achievements were higher in newer buildings and in buildings with higher condition ratings.

However, the results also reveal that nearly half of the schools operate in classrooms that have not been renovated for more than four years.

Principal 4 remarked that,

“As a principal, it is normal for schools to have competing needs. If you prioritize them, classroom renovations can come a distant third. Whatever we have should support a wide range of activities, most academic. If you are faced with getting say laboratory reagents for the lab and re doing the roof, which will you choose? Definitely you will buy lab requirements? That is why when we do renovations, we even may prioritize renovations of the floor at the expense of say replacing broken windows.”

Classrooms that remain un-renovated for long periods are more likely to exhibit physical deterioration, including cracked floors, peeling paint, worn-out fittings, damaged furniture, and poor ventilation systems. Such conditions may negatively affect the comfort, safety, and psychological well-being of learners, thereby reducing the conduciveness of the learning environment. Similar observations have been made by Earthman (2004), who found that poorly maintained school facilities can lower student motivation, increase absenteeism, and ultimately hinder academic achievement.

The findings therefore suggest that schools with recently renovated classrooms are better positioned to provide more conducive learning environments, which support sustained student concentration, improved classroom interaction, and effective lesson delivery. Conversely, prolonged delays in classroom renovation may compromise the quality of the learning environment and reduce the effectiveness of instructional processes. As a result, inadequate maintenance of classroom infrastructure may limit students’ academic engagement and potentially affect their performance in national examinations.

Additionally, the views of the principals during oral interviews confirmed that classroom renovation plays a vital role in improving the quality of the learning environment and enhancing students’ academic achievement.

Principal 11 stated that;

“Renovation of classrooms, such as replacing old floors, repainting walls, and improving lighting, has made a big difference in our school. Students are now more comfortable, and their concentration during lessons has improved significantly.”

whereas principal 12 added that;

“Before renovation, some classrooms were in poor condition, with cracked floors and inadequate lighting, which distracted students during lessons. After renovation, the environment became more conducive, and we have observed improvement in students’ participation and performance.”

These findings reinforce earlier results on classroom conditions and highlight renovation as a key intervention in addressing infrastructural deficiencies. The results are consistent with the findings of Glen Earthman (2004), who established that improvements in school infrastructure, including classroom renovation, have a significant positive effect on students' academic achievement and engagement.

The researcher investigated respondents' perceptions of classroom conditions and how these conditions influence students' academic achievement in public Sub-County secondary schools in Bondo Sub-County. Table 12 therefore presents the descriptive statistics summarizing responses to various statements related to the quality of classroom environments.

Table 12 Descriptive Statistics of Classroom Conditions and Learning Environment

No	Statement	Mean	Standard Deviation	Coefficient of Variation
1	Classrooms walls are bright to motivate learning.	2.00	0.79	39.74
2	No students obstruct another's view due to proper seat arrangements.	1.85	1.04	56.22
3	Air circulating prevents respiratory illness in class	1.75	0.85	48.61
4	Good seating arrangements makes learning interesting	2.00	0.69	34.30
5	Electricity light supply allows for reading without straining	2.11	1.28	60.55
6	There's room for movement between lockers to allow for collaboration and consultation	1.85	0.67	36.26
7	Class is spacious to make retrieval of stored books easy	1.75	0.72	40.94
8	The students desk helps them take notes comfortably thus encouraging academic performance	1.65	0.59	35.58
9	The distance between change over classes is short thus there is minimum time wastage.	1.85	0.88	47.30
10	Desk arrangement is orderly making the learning environment conducive	1.90	0.31	16.20
11	The noise proofing prevents external disturbance.	2.75	0.79	28.60
12	Roof fittings prevent leakages and rainfall noise.	2.80	1.06	37.73
13	The maintenance of blackboard helps the students to see clearly thereby enhancing the academic performance.	2.15	0.88	40.70
	AVERAGE	2.03	0.81	40.21

Table 4.7 presents the descriptive statistics for various indicators of classroom conditions and the learning environment in public Sub-County secondary schools. The analysis utilized the mean, standard deviation, and coefficient of variation to evaluate how different aspects of classroom infrastructure support effective teaching and learning. The overall results show an average mean score of 2.03, a standard deviation of 0.81, and a coefficient of variation of 40.21%, indicating that classroom conditions across the sampled schools are generally moderately inadequate and unevenly distributed. A coefficient of variation exceeding 30 percent suggests considerable variability among schools, implying that while some institutions maintain relatively conducive

classroom environments, others operate under less favorable conditions. Similar disparities in classroom infrastructure have been documented by Suleiman and Otieno (2022), who observe that uneven distribution of educational facilities often leads to unequal learning opportunities across schools.

With regard to classroom aesthetics and visual appeal, the statement that *classroom walls are bright to motivate learning* recorded a mean score of 2.00 with a coefficient of variation of 39.74%, suggesting that classroom visual conditions may not adequately stimulate learner motivation in many schools. Classroom aesthetics, including wall color and brightness, are known to influence learners' psychological engagement and motivation. Studies by Barrett, Zhang, Moffat, and Kobbacy (2015) demonstrate that well-designed classroom environments with visually stimulating colors and appropriate decoration can significantly improve students' learning progress and engagement.

In relation to seating arrangements and learner visibility, the statement that *good seating arrangement makes learning interesting* recorded a mean score of 2.00, while the statement that *no students obstruct another's view due to proper seating arrangements* recorded a mean of 1.85. These relatively low mean values indicate that seating organization in many classrooms may not adequately support effective interaction between teachers and learners. Proper seating arrangements are critical for maintaining clear visibility, facilitating communication, and encouraging active participation during lessons.

Principal 6 said that;

"What appears to be congestion in our classes is because these classes were built when the class population was still at 30 – 35 students. But when the 100 percent transition came, we took in every student in accordance with the government policy. Our classes now host between 50 -60 students. However, we expect class teachers to organize the classes so that there is room for movement amid the rows and leave space for the teacher to write on the chalkboard. Occasionally, we also hold some of our lesson in bigger spaces like the dining hall especially when it is too hot. Or sometimes under the trees when the dining hall is being used for another activity. We have portable boards for such cases".

According to Wannarka and Ruhl (2008), classroom seating configurations significantly influence student engagement, participation, and learning outcomes, particularly when arrangements allow unobstructed views of instructional materials. This finding is supported by the findings of Dudek (2000) who established that uncomfortable and unsuitable classrooms cause problems such as poor concentration span, writing difficulties and illnesses related to congestion thus the learning opportunities are reduced. Ngesu (2014) while studying how infrastructure influences academic achievement established that some of the causes of poor achievement in biology had been caused by overcrowding and poorly equipped schools in Machakos County.

The results further highlight concerns related to classroom space and mobility. The statements that *there is room for movement between lockers to allow collaboration and consultation* (mean = 1.85) and *class is spacious to make retrieval of stored books easy* (mean = 1.75) suggest that many classrooms may be congested and lack adequate space for learner movement. Congested classroom environments restrict collaboration, reduce opportunities for group learning, and complicate classroom management.

The SCDE had this to say on classroom space and mobility',

"It's a professional requirement for teachers to walk about in classes to monitor the participation of each student. This helps in helping the time takers (slow learners) to ensure that each student benefits from the lesson. It is also important to do so since students who are not monitored get easily distracted and may miss on the lesson and even get mischievous. Teachers are expected to be in charge of the classes during lessons to ensure lessons are covered as had been planned to aid in speedy syllabus coverage."

Research by Earthman (2004) shows that overcrowded classrooms reduce the effectiveness of teaching strategies and limit students' ability to interact meaningfully during learning activities. Olufemii and Olayinka (2017) opine that students learning in schools with small class sizes have better quality output than students in schools with large class sizes. Furthermore, a study published by the Los Angeles Unified School District (2001)

established that all factors constant, the longer a student is taught in a smaller class, the higher his or her achievement in reading and language with larger gains being observed in mathematics. Furthermore, overcrowding was disadvantageous as a study by Lackey (2001) established that students in overcrowded scored significantly lower grades in both math and reading as compared to their counterparts in underutilized schools. Similarly, when classes, chairs, desks were inadequate teachers could not effectively manage the classes which clearly translated to poor teaching and learning experiences according to Hamdallah, Ozevehe & Olanrewaju (2013).

Regarding ventilation and indoor air quality, the statement *air circulating prevents respiratory illness in class* recorded a mean score of 1.75, indicating that ventilation conditions in some classrooms may be insufficient. Proper air circulation is essential for maintaining healthy learning environments and sustaining student concentration during lessons. According to Wargocki and Wyon (2013), poor indoor air quality in classrooms has been associated with reduced cognitive performance, fatigue, and increased absenteeism among students. The Centers for Disease Control in New York established that moisture and dampness cause the growth of mold and the proliferation of dust mites which produce allergic respiratory symptoms and foster infections. The study further adds that poor ventilation enables particulates, pollutants and allergens which accumulate inside school building, and insufficient air circulation increases the transmission of respiratory infections. Whenever students fall ill, they have to seek medical attention which bars them from attending school. These finding concur with those of Shendell (2004) who established that in Idaho and Washington that student absences from school jumped by 10 to 20 percent in rooms with poor ventilation. Furthermore, Simons, Hwang, Fitzgerald Kielb and Lin (2010) who found that children who attended schools with poor indoor air quality experience tiredness, lethargy, inattentiveness and because of medical issues, the students miss class.

In terms of lighting conditions, the statement *electricity light supply allows for reading without straining* recorded a mean score of 2.11 with a relatively high coefficient of variation of 60.55%, indicating considerable variation across schools in the adequacy of lighting conditions. Although electricity is available in the schools, differences in lighting intensity, placement of fixtures, and classroom design may affect the quality of illumination. Proper classroom lighting is essential for minimizing eye strain and enhancing visual clarity during reading and writing tasks. Studies by Hescong Mahone Group (2002) demonstrate that adequate classroom lighting significantly improves students' reading performance and overall academic achievement.

Relatively better results were observed in relation to structural classroom conditions, particularly roofing and noise control. The statement *roof fittings prevent leakages and rainfall noise* recorded the highest mean score of 2.80, while *noise proofing prevents external disturbance* recorded a mean of 2.75. These findings suggest that basic structural elements of classroom construction may be relatively well maintained across the sampled schools. Effective building structures and sound insulation help minimize external disturbances and create stable learning environments. According to Maxwell and Evans (2000), exposure to external noise can negatively affect children's reading development and cognitive processing, making noise control an important aspect of school building design.

Furthermore, the statement *desk arrangement is orderly making the learning environment conducive* recorded a mean score of 1.90 with the lowest coefficient of variation (16.20%), indicating that desk organization practices are relatively consistent across the schools. Orderly classroom organization supports effective classroom management and facilitates smooth instructional delivery. Research by Emmer and Sabornie (2015) indicates that organized classroom layouts enhance teacher supervision and promote better student engagement during instructional activities.

Overall, the findings reveal that although some structural aspects of classrooms such as roofing and desk organization appear relatively adequate, several environmental components remain suboptimal. These include classroom aesthetics, seating arrangements, ventilation, lighting consistency, and spatial organization. Such environmental limitations may reduce learner comfort, hinder classroom interaction, and affect students' ability to maintain concentration during lessons. Consequently, inadequate classroom conditions may constrain the extent to which students benefit from instructional time, thereby potentially affecting academic performance in national examinations.

These results emphasize that school plant management involves not only the availability of buildings but also the quality of the internal learning environment. Even where basic infrastructure exists, ineffective classroom layouts, inadequate ventilation, and poor environmental conditions may undermine the effectiveness of the learning process. These findings are consistent with the Education Production Function Theory proposed by Coleman (1966), which posits that educational outcomes are influenced by the quality and management of educational inputs, including physical infrastructure and learning environments. Improving classroom environmental quality through proper maintenance, improved seating arrangements, adequate ventilation, and enhanced lighting conditions is therefore essential for promoting better academic outcomes among students.

SUMMARY OF THE FINDINGS

The integrated analysis of quantitative and qualitative findings reveals a strong convergence on the critical role of school plant management in influencing students' academic achievement in public Sub-County secondary schools in Bondo Sub-County. Quantitative results demonstrated that key components of the school plant such as classroom conditions, science laboratories, ICT facilities, library resources, and boarding facilities exert a generally moderate influence on students' academic achievement, as reflected by mean scores largely clustered around the mid-range and accompanied by relatively high coefficients of variation. These coefficients indicate substantial disparities in the availability, adequacy, and utilization of school facilities across schools. These findings are corroborated by Ibrahim, Umar & Clement (2017) observed that schools that were better equipped with adequate provision of plant facilities are more likely to produce higher level of learning and motivation among students.

Qualitative findings provide contextual depth to these patterns by explaining the sources of variability observed in the quantitative data. Interviews with principals and the Sub-County Quality Assurance and Standards Officer revealed that inadequate funding, weak inspection regimes, lack of technical training, political influence, and delayed maintenance are the primary factors undermining effective school plant management. These challenges account for the uneven facility conditions reflected in the high variability reported in the quantitative analyses. School managers have the role of ensuring that infrastructural needs are well-planned in the spaces available, and budgetary allocations are made for the ones that are needed. Schools boards and Parent Association have the role of funding the school plant needs. As Theodore (2010) put it, availing school facilities is one thing and managing them is another. The researcher adds that school plant organization accounts for 3.7 percent to 6.3 percent of the variance of 5 of the 9 subjects when learning facilities arrangement is correlated with the composite score of the students in lower test of basic skills.

Both data strands converge on the finding that instruction-core facilities, particularly science laboratories and classrooms, have the strongest influence on academic achievement. Quantitatively, these facilities recorded relatively higher mean scores compared to other school plant components, while qualitatively, respondents consistently ranked them as the most supportive of high performance in national examinations. Ajayi & Yusuf (2009) affirmed that high academic achievements by students can only be guaranteed when instructional spaces such as classrooms, libraries, workshops and laboratories are structurally sound. Comparatively, this study established that inadequate laboratories were linked to reduced frequency of practical lessons, while poor classroom conditions were associated with learner discomfort and reduced instructional effectiveness, thereby weakening examination preparedness.

CONCLUSIONS

The Extent to which Classroom Conditions Influence Students' Academic Achievement in Public Sub County Secondary Schools

The study sought to establish the extent to which classroom conditions influence student's academic achievement in public Sub County schools in Bondo Sub County. The findings of this study have established that classroom conditions have a significant influence on students' academic achievement in sub county public secondary schools. While the MOE (2001) stipulates that classes should accommodate a maximum of 40 learners, the study established that the classes were congested which makes intra class movement and collaboration difficult. Overcrowding can lead to aggressive behaviour, negatively influence classroom activities

and instructional techniques, lead to decreased interest in learning which in turn affect students' academic achievements. Class populations should encourage collaboration, cooperation and communication among the students. Classroom organization should help students focus better, and make students feel at ease, foster group discussions thereby improving students' academic achievements. Classroom components influence students' academic achievement. The acoustics and indoor air quality when poorly maintained can be distractors to learning and poor air quality can lead to respiratory infections which result in absenteeism as students will be out of school seeking medical attention. This is especially in students with asthma and respiratory problems. To corroborate these, Simons, Hwang, Fitzgerald, Kieb & Lin (2010) established that students who attended schools with poor indoor air quality were prone to lethargy, tiredness and difficulty focus in in class. Furthermore, their medical issues some students missed classes, and the whole, their academic achievement was affected

Even though natural lighting has been found to enhance mood and also reduce off task behaviour among students, sub county public secondary school rely solely on electricity. Bailey (2009) established that students exposed to natural lighting progressed 20 percent on math test and 26 percent faster on reading test in one year compared to students who learned in classrooms lit by artificial lights. The over reliance on electricity as the main source of energy with no back up plans in case of power outages is a pointer to disruptions in the learning process in case of power outages and the disruption of other technological systems that support learning.

With a majority of schools being located around highways, there is noise distraction that affects learning. Students attending schools with lower levels of background noise tend to be more engaged and productive as compared to those in schools with higher noise levels. Adesina (2011) corroborates these findings by stating that when classrooms are properly planned in terms of location, structure and facilities, there was an enhanced teaching and leading which lead to better students' academic achievements.

Even though the government in its Safety Standards Health Manual for secondary schools (2012) encourages regular inspection of classroom and other school plants on a day to day basis using an observation checklist, this was not formally done as no school had a formal inspection schedule. The Manual requires schools to keep a checklist that is maintained on a daily basis to assess the school plants as well as their safety. Each school is expected to keep checklists, questionnaires, scales and tests that they use to evaluate the soundness of the school plants. This is an oversight that can cause schools to incur major loses as simple situations can worsen and lead to disruption in learning and negatively influence students' academic achievements. Simons, Hwang, Fitzgerald, Kieb & Lin (2010) have established that ineffective management and inadequate maintenance of school facilities have a negative impact on learning.

REFERENCES

1. Adesina, S. (2008). (Ed.) Introduction to Educational Planning Academic Achievement of Secondary School Student University of Ile Ife.
2. Adesina, B. A., (2011). School Plant Planning as Correlate of Students' Academic Achievement in Southwest Nigeria Secondary Schools.
3. Aghajari, S., & Chen, C.-C. (2025). Optimizing classroom lighting for enhanced visual comfort and reduced energy consumption. *Buildings*, 15(8), 1233. <https://doi.org/10.3390/buildings15081233>
4. Ahmed, A., (2003). The Impact of School Physical Environment on Teacher Performance and Student Learning Outcomes. Academic Press.
5. Ajayi, I. A., & Yusuf, M. A. (2009). Instructional space planning and students' academic achievement in Southwest Nigeria secondary schools. *Int Edu Science, Vol 1*.
6. Ajayi, K. F., & Ros, P. H., (2020). Effects of Education on Financial Outcomes: Evidence from Kenya. *Economic Development & Cultural Change*.
7. Akinsolu, R. A. (2004). Provision and management of facilities in Nigerian primary schools. In E. O. Fagbamiye, J. B. Babalola, M. Fabunmi and Ayeni (Eds.), *Management of primary and secondary education in Nigeria*. NAEAP Publications.
8. Ali, N., Ahmad, B., & Ahmad, T., (2020). Effects of School Building on Academic Achievement of Secondary School Students in Southern KP, Pakistan. *Global Educational Studies Review (GESR)*.

9. Ali, S., Haider, Z., Munir, F., Khan, H. and Ahmed, A. (2013) 'Factors contributing to the students' academic achievement: a case study of Islamia University Sub-campus', American Journal of Educational Research, Vol. 1, No. 8, pp.283–289.
10. Amukowa & Karue. (2013). Analysis of Factors that Lead to Poor Achievement in Kenya Certificate of Secondary Examination in Embu District, Kenya. The International Journal of Social Sciences Vol. 13(1), ARF Publication, Pakistan.
11. Anderson, H.M (n.d). *Dale's Cone of Experience* [Online]. Available from: http://www.queensu.ca/teachingandlearning/modules/active/documents/Dales_Cone_of_Experience_summary.pdf (Accessed: 15th March 2019).
12. Andrew, J. M., (2004). Managing School Infrastructure: Strategic Asset Planning and Educational Outcomes. Victorian Auditor-Generals Ministerial Report.
13. Asiegbu, E. C. (2014). School Plant Management. In Unachukwu, G.O & Okorji P.N (ed). Educational Management: a skill building approach. Anambra: Rex Charles & Patrick Limited. 313-338.
14. Asiegbu, E. C. (2021). School Plant and Academic Achievement of Students in Public Secondary Schools in Nnewi Education Zone of Anambra State Journal Plus Education, Vol 29, no.2/2021 pp. 174-189.
15. Assoumpta, U, I., & Andala, H, O. (2020). Relationship Between School Infrastructure and Students Academic Achievement in Twelve Years Basic Education in Rwanda. Journal of Education 1. 60-75.
16. Baghdady. A., & Zaki, O. (2019). *Secondary education governance in Sub-Saharan Africa. Secondary education in Africa*. From [https:// masrecardfdn.org](https://masrecardfdn.org).
17. Bailey, J. 2009. A synthesis of studies pertaining to school building condition, student achievement, student behavior, and student attitude. PhD dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.
18. Banke, S. A., Zakari, B., & Audu, M. H., Employing Social Studies Education in Accomplishing Universal Basic Education Programme for Sustainable Development. https://Aipublisher.Org/Resources/Article_Documents/Article_Docajahss.3.11_3.Pdf
19. Barret, P., Zhang, Y., Davies, F., & Barrett., (2015). Clever Classrooms: Summary report of the HEAD project. University of Salford. Bluysen, P. M., (2016). The Role of flooring materials in health, comfort and Performance of Children in Classrooms. DOI 10.1080/23311908.20161268774.
20. Borg, W.R. & Gall M.D. (1989). Educational Research: An Introduction 4th Ed. New York: Longman.
21. Bowles, S. (2016). Towards an Educational Production Function in W. L. Hansen (Ed). Education, Income & Human Capital. Pp 11 -70. National Bureau of Economic Research.
22. Brewer, D. & Hentschke, G., (2010). Theoretical Concepts in the Economics of Education. In: E. Eide, ed. *Economics of Education*. Provo: Brigham Young University, pp. 193-198.
23. Briggs, B.P. & Walson, O.B.A. (2018). Contributions of school plant management towards teaching and learning process in public secondary schools in Rivers State. International Journal of Innovative Social & Science Education Research. 6(3): 52- 60.
24. Cash, C. S. (1993). Building Condition and Student Achievement and Behavior Unpublished Doctoral Dissertation, Blacksburg, VA: Virginia Polytechnic Institute and State University.
25. Clark, L. A., & Watson, D., (2024). Constructing Validity: New Developments in Creating objective measuring instruments. Methodological issues and strategies in clinical research. 5th Ed. American Psychological Association.
26. Coleman, J. S. (1966). Equal schools or equal students?. *The Public Interest*, 4, 70. <https://search.proquest.com/openview/57c71ff399a1e24e63048f17d44a83ac/1?pq-origsite=gscholar&cbl=1817076>
27. Creswell, J.W. (2009) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (3rd ed. Edition) London: Sage.
28. Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.
29. Creswell J. W., Plano C. V. L., Gutman, M. L., & Hanson W. E. (2003). Advanced Mixed Methods Research Design. Handbook of Mixed Methods in Social and Behavioural Research. pp(209 - 240). Thousand Oak, CA: Sage.
30. Cohen, I & Manion, L. & Morrison. (2007). Research Methods in Education. London. Routledge Falmer.

31. Coleman, J. S., Ernest, Q. C., Carol J. H., James, M., Alexander, M. M., Frederic, D. W., & Robert L. Y. (1966). *Equality of educational opportunity*. Washington, D.C.: U.S. Government Printing Office.
32. Dadzie M. (2010). Study on Poor Educational Infrastructure and the Attitude of some Stakeholders in Education, Accra, Ghana.
33. Dale, E. (1969). *Audiovisual Methods in Teaching*. New York: Dryden Press.
34. Dar, S. A., & Bhat, R. A. (2024). The impact of classroom environment on student learning and engagement. *Vidyabharati International Interdisciplinary Research Journal*, 18(1), 74–78.
<https://www.viirj.org/vol18issue1/13.pdf>
35. Dare S.D. (2010). Ergonomically correct classrooms: Consider students developmental needs when furnishing your schools. *Learning by Design*, 7, 18-20.
36. Dudek, M. (2000). *Architecture of schools, the new learning environment*, oxford architectural press, P.xiv.
37. Duran-Nurucki, Valkiria. 2008. School building condition, school attendance, and academic achievement in New York public schools: A mediation model. *Journal of Environmental Psychology* 28(3):278–286.
38. Earthman, G.I. (2017). The relationship between school building condition and student achievement: A critical examination of the literature. *Journal of Ethical Educational Leadership*, 4(3), 1-16.59-75).
39. Fairchild, J. A. (2002). *Instrument Reliability and Validity: Introductory Concepts and Measure*. Philadelphia: James Madison University.
40. Fidler, Penny. 2001. *The Impact of Class Size Reduction on Student Achievement*. Planning, Assessment and research Division Publication no. 109, los Angeles Unified School District.
41. Foroudi P., Palazzo M., & Stone M., (2022). *Mixed Methods Research – why and how to use it in Research Methodology in Marketing*. Routledge.
42. Frontzack, M., & Wargock, P., (2011). Literature survey on how different factors influence human comfort in indoor environments. build. Doi: 10.106/j.buildenv.2010.
43. García, M., (2013). The need for holistic approach in Education: Non-Cognitive skills in the Education Production Function. Economic Policy institute.
44. Hanushek, E. and Kimko, D., (2000). *Schooling, labor force quality, and the growth of nations*. *American Economic Review*, 90(5), pp. 1184-1208.
45. Hamdallah, A., Ozevehe, A., Olanrewaju. (2013). Provision and Management of School Plant as a correlate of Science Students Academic Achievement.
46. Heschong, L. (2002). Daylighting and human performance. *ASHRAE journal*, 44(6), 65-67.
<http://www.livingdaylights.nl/wp-content/uploads/2016/12/Heschong-2002.-Daylighting-and-Human-performance..pdf>
47. Ibrahim, W.Y., Umar, H., & Clement, I. (2017). Impact of school facilities on students’ academic achievement.
48. Mighir, C. and Rivkin, S., (2011). *Econometric Methods for Research in Education*. Working Paper W10/10, London: Economic and Social Research Council.
49. MoE, (2008). *Safety Standards Manual for Schools in Kenya*. Nairobi: Government of Kenya.
50. MoE, (2001). *Health and Safety Standards in Educational Institutions*. Nairobi: Government of Kenya.
51. Mokaya, Z. M. (2017). *Influence of School Infrastructure on Students’ Achievement in Public Secondary Schools in Kajiado*. University of Nairobi.
52. Nanyonjo N. (2007) *Effective use of education inputs in Uganda: An Analysis of factors influencing learning, Achievement in Grade Six African Human Development Series working paper No. 98*. Washington. The World Bank. 2007.
53. Ngesu, M. L. (2014). Critical determinants of Poor Achievement in KCSE of Girls in Marginalized Regions in Kenya. *Journal of African Studies in Educational Management and Leadership*. 2(1):63-71.
54. Ogunsaju, V., (2010). Influence of School Plan Entrepreneurial. *Journal Education*. 8(2):10 – 15.
55. Olufemi, A. (2017). Impact of principals’ leadership styles on teachers’ job performance in secondary schools in Education District V, Lagos state. Un-published PGDE project, National Open University of Nigeria, Lagos.
56. O’Neil, J. D & Oates, D. A (2001). *The Impact of School Facilities on Students Achievement, Behaviour, Attendance, and Teacher Turnover Rate in Central Texas Middle Schools*.

57. Oso, Y. W. & Onen, D. (2005). A General Guide to writing Research Proposal and Report: (pg 18, 25, 32) Jomo Kenyatta Foundation, Nairobi.
58. Orodho, A. J. (2009). Essentials of Educational and Social Science Research Methods. Nairobi:Mazola Publishers.
59. Pediatr, J. (2005). School Health, security measures, accident prevention, violence. School health guide lines to prevent unintentional injuries and violence. www.cdc.gov/mmwr/preview/mmwrhtm/rr5022a1.htm.
60. Permana, B. S., Rohmatilahi, L., Dinarti, N. S., Kholisah, N., & Rostika, D. (2024). Analysis of the impact of lack of classrooms on students' conduciveness while learning. *Progres Pendidikan*, 5(2), 134–138. <https://doi.org/10.29303/prospek.v5i2.408>
61. Psacharopoulos, G., and Patrinos, H., (2004). Returns to investment in education: a further update. *Education Economics*, 12(2), pp. 111-134. Richards, M. S., Rittman, M., Gilbert, T. T., Opal, S. M., DeBuonon, B. A.,
62. Sanoff, H. (2001). Research Based Design of an Elementary School, *Open House International journal*, Vol 34(1) p (9- 6).
63. Simons, E. S. -A. Hwang, E. F. Fitzgerald, C. Kielb, and S. Li. 2010. The Impact of School Building Conditions on Student Absenteeism in Upstate New York. Washington, D.C.: National Library of Medicine, National Institutes of Health.
64. Sixbert, B., & Onyango, D. (2022). Effect of shortage of teachers on job performance in publicsecondary schools in Geita District, Tanzania. *East African Journal of Education Studies*, 5(2), 88–96. <https://doi.org/10.37284/eajes.5.2.666>
65. Suleiman, E., & Otieno, K. O. (2022). Influence of school learning environment on qualityeducation inpublic secondary schools in Arusha City Council, Tanzania. *Journal of Research Innovation and Implications in Education*, 6(3), 58–68. <https://www.jriiejournal.com/wpcontent/uploads/2022/07/JRIIE-6-3-008.pdf>
66. The Star Lifestyle. Jan (2023). Bad Schools, Bad Habits Shape KCSE achievement: Lack of level playing field hurts students in Sub County Schools.
67. Wannarka, R., & Ruhl, K. (2008). Seating arrangements that promote positive academic and behavioural outcomes: A review of empirical research. *Support for learning*, 23(2), 89-93. <https://nasenjournals.onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9604.2008.00375.x>
68. Wekesa, N. A. (2025.) How different Schools Performed. The Kenya Times.
69. Williams, E., Persaud, G., & Turner, T. (2008). In Linda, K. Lemasters (Ed). International Society for Educational Planning (ISEP). George Washington University, Washington D.C.
70. Willms, J. D. (2000). Standards of Care: Investments to improve children's educational outcomes in Latin America. Paper presented at the Year 2000 Conference of Early Childhood Development sponsored by the World Bank, Washington, D. C., April, 2000.
71. World Green Building Council. 2022. Can Indoor Finishing improve the air we breath?