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Review

Status of Staffing and Academic Performance in English and STEM Subjects in Selected Secondary Schools in Vihiga, Kakamega and Kisumu Counties, Kenya

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Excellent staffing begins with hiring the right people and placing them in a position with responsibility that allows them to maximize their skills, knowledge and talent. For schools to be effective in delivering on their core mandate of teaching and learning, they are supposed to be adequately staffed with enough teachers with the right skills and competencies as they constitute the core of the education system and they are important in student performance. However there seems to be a disconnect in this in English and STEM subjects in Kenya. To ascertain the staffing in English and STEM subjects a survey was conducted in selected schools in Vihiga, Kisumu and Kakamega counties. The objective of the study was to establish the staffing levels in English and STEM subjects and how this affects academic performance. A mixed method research approach was adopted and data was collected from school stakeholders namely; principals, teachers of the concerned subjects, Boards of Management and Parents Association representatives. Data was collected through interviews and document analysis and analyzed qualitatively and quantitatively. Data was presented through tables, verbatim quotations and grouped themes. It was found that in the selected schools, there were more male teachers in English and STEM teachers compared to females. The schools in the study area had about 65% of the teachers employed by the Teachers Service Commission (TSC) with the difference, 35% employed by the School Boards. An analysis of the Teacher student ratio in each of the subjects demonstrated that there was gross understaffing in the schools in subjects. It was observed that understaffing affected effective teaching hence contributing to poor performance in these subjects. It was concluded that there were more male teachers in STEM and English, schools were not adequately staffed and teacher student ratios in English and STEM were too high. Out of the conclusions it was recommended that there was need to train more female English and STEM teachers to serve as role models for many girls, who do not take STEM related careers, there is need for the TSC to employ more teachers to relieve the schools from employing teachers and concentrate to finance other aspects in the schools. There is a need to reduce the teacher student ratio to the recommended levels of about 1:45 to enable teachers to employ more of the student centered learning methods to promote effective learning in English and STEM subjects.

Key words: Staffing, STEM education, academic performance, learning, teaching

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INTRODUCTION

Staffing is an important function of Human Resource Management in any organization. It is a set of activities aimed at attracting and selecting individuals for positions in a way that will facilitate achievement of organizational goals (Batrol and Martin, 1991, Okumbe, 1999; Okumbe, 2001). It involves the process of filling the vacant positions with the right personnel at the workplace. Staffing norms are aimed at achieving growth and development for increased competitiveness, survival and performance of any organization. According to (Kim, 2003) it is the extent of hierarchy of differentiated staff roles and responsibilities; the way that individual staff responsibilities are associated with curricular specialization; and the degree to which the roles of instructional staff are interdependent or interactive. As (Roger, Winston, Don, and Greamer, 1997) argue, excellent staffing begins with hiring the right people and placing them in a position with responsibility that allows them to maximize their skills, knowledge and talent. For schools to be effective in delivering on their core mandate of teaching and learning, they are supposed to be adequately staffed with enough teachers with the right skills and competencies as they constitute the core of the education system and they are important in student performance (Rivkin, Stephen, Ertik & John, 2000). If schools suffer understaffing, it harms students, teachers, and the public education system as a whole. Lack of sufficient, qualified teachers and the staff instability threaten students' ability to learn and reduces teachers' effectiveness. High teacher turnover consumes economic resources that could be better deployed elsewhere. Further, teacher shortage makes it more difficult to build a solid reputation for teaching and to professionalize it. The fact that the shortage is distributed so unevenly among students of different socioeconomic backgrounds, challenges the education system's goal of providing education equitably to all children (García, and Weiss, 2019).

Staffing norms in Kenya are guided by policies set by the government from time to time and they express the government's commitment to staffing of all schools according to the approved Curriculum Based Establishment (CBE). However, adequate staffing for schools has not been achieved owing to attrition and migration among other factors (Amolo, Ajowi and Raburu, 2016). Understaffing of schools is not unique to Kenya. Internationally, according to Santiago (2002), there is a severe shortage of teachers and there is a gap between demand and supply of teachers needed to ensure effective teaching in many countries; that all countries face the same challenge and they keep on reengineering their staffing policies for effective learning in schools. In America for instance, severe staff shortages were reported where according to (Amolo, Ajowi and Raburu, *ibid)* America introduced Teach for America (TFA) policies aimed at attracting the best, brightest and talented students to be recruited to energize school improvements. The situation is not any different in America as of 2019. According to García and Weiss, (2019) teacher shortage is real and it continues to grow, and it worsens when issues of teacher quality are taken into account, with high-poverty schools suffering the most from the shortage of credentialed teachers. In the United Kingdom, teacher shortage was reported, occasioning bigger class sizes and more subjects taught by staff without a relevant degree, according to the Education Policy Institute (EPI). It was also reported that the situation was worse in Mathematics and the Sciences (LPI, 2017). This resonates well with what Jacob (2007) reported in Chicago, that, there were severe shortages in certain subjects and grades more than others, and it differed dramatically from one school to another.

The reasons for teacher shortage in Kenya are varied and as the government keeps on addressing this through the staffing norms, new reasons keep on emerging. In the 1990s for example, the major challenge facing the education system in Kenya was the demand for more teachers against a constrained budget. The budget constraints led to the teacher employment freeze between 1998 and 2000 by the Teachers Service Commission (Wamukuru, 2016). Later in 2003 when Free Primary Education (FPE) was introduced and free day Secondary Education in 2008 there was an increase in demand for teachers (Republic of Kenya, 2018).

Teacher shortage in Kenya as of 30th June, 2018, was estimated at 96,345 with 38,054 at Primary and 58,291 at Post-Primary school level. The shortage was attributed to rapid growth in school enrolment and various initiatives in the education sector that have necessitated the establishment of new and expansion of existing schools. These initiatives include the Government policy of 100% learner transition from primary to secondary and it is projected that by 2023, the teacher shortage will be at about 61,671 for secondary and 34,941 for primary schools (Wihenya and Nyamai, 2019). Thus, the teacher demand has occasioned understaffing in most of the schools as the student teacher ratios increased in the existing schools. Worst hit were the newly established schools which had very few TSC appointed teachers, resorting to Boards of Management recruiting teachers some of whom were not trained yet, for effective teaching in schools, there is need for professionally trained teachers (Francis, 2007).

Understaffing is likely to have a negative impact on the quality of teaching and learning in schools (Wamukuru, 2016) occasioned by the shortage of qualified staff and or availability of trained staff who do not utilize modern teaching approaches. Untrained teachers are usually not equipped with observation skills and are unable to

differentiate learners' learning abilities and or identify learners who have learning difficulties. They may also not be able to provide extra remedial work to the slow learners. Such teachers may not understand that learners differ in their rates of understanding the concept and they require varying teaching methods to meet their individual unique needs (MOEST, 2001). Further, Wanjohi (2018), argues that such teachers find it hard to plan various teaching objectives effectively and thus, if teachers are to improve the teaching they must seek first to create enthusiasm among pupils who they are going to teach.

The challenge of staffing in school is therefore real and usually it has an impact on the teaching and learning. As it was observed by (Amolo, Ajowi and Raburu, 2016; Wamukuru, 2016) understaffing has been more pronounced in the Science, Mathematics and English subjects. That is why in 1996, the Teachers Service Commission introduced special subjects allowances for teachers teaching mathematics, sciences. Languages; that is, English and Kiswahili were included in this category of subjects in 1997(Wamukuru, 2016). Currently, the teacher shortage in the same subjects has persisted and we have a new inclusion; computer studies. The reasons for teacher shortage in these subjects are brought about by very few teacher trainees joining colleges to take these subjects and a number of them opting to leave the teaching career for other careers especially in the private sector and also teacher burnout brought about by high workload in these subjects in some schools (Nzomo, 2019). This explains partly why there is a persistent poor performance in these subjects at a time when the government is very articulate on realizing Vision 2030 through STEM education.

STEM education is practical oriented and innovations in the way learning is done and connected to real life through application of science, technology, engineering and mathematics by students with guidance from teachers is critical yet without teachers with the required competencies and skills, realizing the vision of STEM education will be a mirage. To effectively teach STEM subjects and give attention to the students, there is need for small classes. Smaller classes allow teachers to focus more on the needs of individual students and reduce the amount of time needed to deal with disruptions. They contribute to a better learning environment for the students, and to improved working conditions for teachers and staff (OECD, 2019).

At the secondary school level in Kenya, the Student Teacher ratio as of 2014 was 41.5. This compared favorably with the international norm at 40. This considered only the Teachers employed by the TSC. If the teachers employed by the school boards are considered, who stand at around 33%, the Student Teacher Ratio dropped to 34.5(MOEST, 2014). Though the global statistics depict a positive picture, schools are generally found to suffer poor staffing in STEM subjects. Equally, with the current government of Kenya 100% transition, school enrollment is bound to increase hence interfering with the student teacher ratio which in effect would affect the level of teacher effectiveness in handling the STEM subjects and English. Out of the staffing challenges occasioned by the 100% transition policy the TSC has taken to revise the staffing norms.

It was against this understanding that this study set out to establish the staffing status in STEM and English in selected schools in Vihiga, Kisumu and Kakamega Counties.

PROBLEM STATEMENT

Poor performance in English, Mathematics and the Science subjects has remained a challenge in Kenya over the year (Kenya National Examinations Council (KNEC) Reports, 2008; 2014; 2015; 2016 and 2017). This threatens the quality of the graduates transiting form the secondary schools to the tertiary institutions. Some of the reasons advanced for the poor performance include but not limited to: understaffing which leads to heavy workload, large classes, class size, inadequate teaching/learning materials, poor teaching methods/skills, lack of motivation and negative attitudes by both teachers and students, retrogressive practices, lack of frequent practice by students, influence of previous poor performance and in some instances absenteeism (Bunyi, 2004; Wambui 2005; Amunga and Amadalo, 2011; Mbugua *et.al*. 2012; JICA, 2013; Karigi and Tumuti, 2015; Katiambo, Wasike and Musotso, 2018). Whereas there could be many factors contributing to the poor performance as enumerated above, the issue of staffing and teaching methods is critical. Indeed as (Waihenya and Nyamai 2019) reported, staffing is a challenge in Kenya in that the expected average student-to-teacher ratio is 1:45, but majority of schools are operating with a rate of 1:60 or more, leading to a stressed-out learning environment with minimal teacher-to-student individual contact. The teacher shortage gets more complicated in the teaching of English and STEM subjects which demand for more teacher student interaction. In reality when there is teacher shortage, learning methods are limited to teacher centered models and individualized instruction is lost yet the practical oriented STEM subjects are best taught and learnt through student centered models where observation, problem solving, analysis, reflections on work, drawing conclusions and generating findings and predictions are key (Mungure,2017). Out of the concern on the poor performance in English and STEM subjects this study set out to investigate the status of staffing in English and

STEM subjects in the selected schools in Vihiga Kisumu and Counties.

OBJECTIVE OF THE STUDY

The objective of the study was to establish the staffing levels in English and STEM subjects and how this affects academic performance in selected secondary schools in Vihiga, Kisumu and Kakamega Counties, Kenya.

METHODOLOGY

Research Design

To draw on strengths of both qualitative and quantitative approaches, a mixed method research approach was adopted. Using mixed method research approach contributes to the depth and breadth of a study and helps overcome the weaknesses of both methods (Johnson 2012). Moreover, integrating qualitative and quantitative methods produces better results in terms of quality and scope. This is based on the notion of triangulation and complementarity (Kombo & Delno, 2006).

Study Site

The survey was carried out in Kakamega, Vihiga and Kisumu Counties of Western Region in Kenya. Specifically, the survey was conducted in twelve (12) rural sub-county secondary schools comprising four (4) girls schools, four (4) boys schools and four (4) mixed (co-educational) schools. This composition took care of the various student characteristics and school classifications thus ensuring a sample representative of the population. The justification for selection of the rural sub-county schools was in the fact that literature indicated persistent dismal performance of students in STEM and language subjects, especially in Biology, Chemistry, Mathematics and English. The poor performance by students in the rural sub county schools is attributed to a myriad of challenges and this was set out for achievement in this survey. The situation is compounded by the fact that the sub-county schools are the lowest category of secondary schools in Kenya and draw students from the surrounding communities, majority of whom are from the lowest socio-economic status who cannot afford the well-equipped and high performing secondary schools in the country even with the subsidized secondary education since 2008 in Kenya.

Target Population

From each of the twelve (12) sampled schools, data was collected from students, the Board of Management (BOM) chairperson, Parents Association (PA) chairperson, School Principal, Deputy Principal, Director of Studies/Curriculum, and Teachers of English, Mathematics, Biology, Chemistry, Physics and Computer Studies. These participants were selected for this study because they are the key stakeholders in the secondary schools and play key roles in teaching and learning.

Methods of Data Collection

Both primary and secondary data were obtained in this study. Primary data were obtained using interview schedules and through observations. Secondary data on the other hand were obtained by use of document analysis schedules.

Interviews

Interview sessions were held with the BOM chairpersons, PA chairpersons and School Principals to establish and secure their commitment to project impact. Interviews were also held with subject teachers to establish staffing challenges encountered in schools as far as teaching and learning English, Mathematics, Chemistry, Biology, Physics and Computer Studies were concerned.

Document Analysis

School records were sought and recorded. Such records included student enrolment by grade, gender and subject and, school staffing by subject, gender and employment status.

Data Analysis and Presentation

This study generated both qualitatively and quantitatively data. Therefore, both qualitative and quantitative techniques were employed to analyze the data. Qualitative data was analyzed thematically, whereas quantitative data was analyzed descriptively through measures of central tendency and dispersion. The findings were presented descriptively in tables.

FINDINGS AND DISCUSSIONS

Staff Demographic Data

Data on staffing was computed and analyzed by gender, area of specialization and employment status. Teacher distribution by gender is presented in Table 1.

Teacher Distribution by Gender

Table 1: Distribution of teachers of English and STEM subjects by Gender

SN	School	ENG		MATHS		BIO		CHE		PHY		COM		Distribution	
		M	F	M	F	M	F	M	F	M	F	M	F	% M	% F
1	A	3	2	6	2	3	4	3	2	2	0	1	0	49	51
2	B	1	2	2	3	2	3	2	2	2	0	0	0	47	53
3	C	1	1	3	0	1	1	1	0	2	0	0	0	64	36
4	D	3	2	6	3	4	1	4	2	3	0	0	0	69	31
5	E	1	3	4	3	1	5	2	3	3	1	1	1	42	58
6	F	1	3	6	1	3	2	3	2	3	1	2	0	56	44
7	G	1	2	3	0	2	1	2	0	2	0	0	1	61	39
8	H	2	3	4	1	4	4	4	0	4	0	1	0	66	34
9	I	1	4	3	2	2	2	2	2	2	1	-	-	57	43
10	J	1	0	1	1	2	0	0	1	1	0	-	-	41	59
11	K	1	1	4	0	3	1	2	1	1	0	-	-	77	23
12	L	1	3	1	3	4	1	3	1	1	1	-	-	64	36
Average		1	2	3	2	3	2	2	1	2	1	1	1	58.5	41.5

Source: Field Data

Data in Table 1 shows that the majority of English and STEM teachers, 58.5% in the schools were male. The findings suggest gender difference among professionals in English and STEM. As it is, there are fewer female teachers in STEM and English compared to their male counterparts. This implies that there are few role models to girls in STEM from among the teachers. Moreover, the findings reveal few numbers of teachers, especially in Computer Studies, Physics and Chemistry. The findings of this survey reflect what has been in Kenya for a long time that; few ladies qualify to train at tertiary level compared to the males and the situation gets dire with STEM subjects. According to (Sichangi, 2017) lack of role models for girls in secondary education where female teachers are fewer than male teachers is a major contributor to girls' performance and representation in STEM in tertiary institutions. Shichangi(*ibid*) argues, in Kenya, out of the top 100 best performing students in KCSE 2014, only 17 were girls, mostly from high-cost national secondary schools and the situation worsens in the low-cost district secondary schools. Other factors contributing to this are issues of teachers' negative attitudes and poor approaches to teaching of STEM which are argued to be insensitive to girls' needs. Mbirianjau (2018) further observes that, in Kenya, STEM participation shows a clear gender disparity ranging from 30%-35%. That, fewer women participate and even fewer complete their studies. In addition, she argues that their graduation scores are low compared to those of males. Mbirianjau (*ibid*) notes those institutional and socio-cultural barriers of; gender stereotyping, sexual harassment and family responsibilities contribute to poor performance of female students in these disciplines. These findings and arguments clearly show there is a gap that needs to be filled as far as staffing is concerned if we are going to have more female teachers in English and STEM in secondary schools.

Teacher Distribution by Employment Status

The study also sought to establish teacher distribution by employment status. The data was collected from though documents analyzed from staffing records. The findings are presented in Table 2 and revealed that not all schools are adequately staffed by the Teachers Service Commission (TSC); the primary employer of teachers. As (Wihenya and Nyamai 2019) observed, understaffing in schools in Kenya is real and the findings reported here attest to this in the selected schools in the three counties. The school Boards of Management (BOM) in the schools employed a number of teachers to fill the teacher deficit in all subjects. The finding suggests understaffing in all the subjects of study where on average in all schools the TSC has employed and posted more than 60% of the teachers required in those schools in English and STEM subjects. The understaffing could be explained by the budgetary constraints in teacher recruitment where the TSC recruits teachers annually to replace those who exit the service only after they have received funds for the exercise by the government (Wihenya and Nyamai, 2019).

Table 2: Distribution of teachers of STEM subjects by Employment Status

SN	School	ENG		MATHS		BIO		CHE		PHY		COMP	
		TSC	BOM	TSC	BOM	TSC	BOM	TSC	BOM	TSC	BOM	TSC	BOM
1	A	3	2	6	2	5	2	4	1	2	0	0	1
2	B	2	1	3	2	5	0	4	0	2	0	0	0
3	C	1	1	1	1	1	1	1	0	2	1	0	0
4	D	2	2	3	6	3	2	2	4	1	2	0	0
5	E	2	2	5	2	3	3	3	2	3	1	0	2
6	F	2	2	4	3	2	3	2	3	2	2	1	1
7	G	3	0	2	1	3	0	2	0	1	1	0	1
8	H	4	1	4	1	5	3	2	2	2	2	0	1
9	I	3	2	5	0	3	1	4	0	3	0	-	-
10	J	0	1	1	1	1	1	1	0	0	1	-	-
11	K	1	1	4	0	4	0	3	0	1	0	-	-
12	L	3	1	3	1	4	1	4	0	1	1	-	-
	Total	**26**	**16**	**42**	**20**	**39**	**17**	**32**	**12**	**20**	**11**	**1**	**6**
	Percentage	**62%**	**38%**	**68%**	**32%**	**69.6 %**	**30.4 %**	**73%**	**27%**	**64.5%**	**35.5 %**	**14%**	**86%**

Source: Field Data

Understaffing is worst in Computer studies in that, out of the five schools offering the subject, only one had a teacher employed by the TSC. All other teachers were employed by the BOMs. The challenge with teachers on BOM is that they are less likely to stay in one school for a long period of time as they continue looking for greener pastures in the private sector (Nzomo, 2019). This greatly interferes with the flow of school programs and activities. Further, interviews with the principals, the BOMs and teachers indicated that some of the teachers employed on BOM terms were not trained as teachers and they were keen to look for employment elsewhere. Teacher turnover in computer studies as it was reported in one of the schools offering the subject was a major challenge.

The shortage of computer studies teachers was occasioned by the fact that there are very few universities and colleges training teachers of computer studies. Attraction of teachers into this subject is low because it has not been offered in many schools as it is an optional subject. Many schools also do not offer computer studies because they do not have the basic infrastructure to offer the subject. To offer computer studies, the schools should be at least having a steady supply of power and they should have functional computer laboratories which are adequately equipped. Due to financial constraints, many schools are not able to invest in computer laboratories too. Lukalo (2009) argues that teaching of computer studies has been left to those schools and geographical regions where appropriate infrastructure is available, especially urban schools, private and public schools with adequate resources. A Guest Writer (2011) enumerates challenges facing computer studies in Kenyan schools as lack of qualified teachers, lack of computers, lack of electricity, cost of computers, burglary, lack of internet and slow connectivity among other factors. This depicts the typical schools where the study was carried out. It was not a surprise to find that only five schools were offering computer studies and in these schools only one school had a TSC employed teacher for computer studies and the rest of the schools had BOM employed teachers most of whom were not professionally trained.

Staffing levels and Enrollment

Further analysis was done to determine whether the schools were adequately staffed in English and the STEM subjects and to determine whether the staffing level contributed to poor performance in these subjects. This was meant to establish whether teachers had adequate time to give attention to individual students. For each school, the number of teachers per subject was computed and compared with the enrolment in each of the subjects. Interviews were also conducted to get the opinion of different stakeholders about staffing and academic performance. The findings were presented in six tables; tables 3 to table 8.

Staffing levels enrolment and performance in English

Table 3 presents the student teacher ratio in English. From the table, all schools are understaffed in English. For instance in school (A) there were five teachers handling Seven Hundred and Twenty Nine(729) students giving a ratio of One teacher to One Hundred and Forty Six (146) students. This ratio is way above the recommended teacher student ratio of 1:45 students. The best recorded ratio was in school (J) of 1:68 which is almost the average reported of all schools in Kenya of 1:60(Wahienya and Nyamai, 2019).

Table 3: Teacher Student Ratio in English in 2020

SN	School	Total English teachers per school	School Enrollment	Teacher Student Ratio
1	A	5	729	1:146
2	B	3	425	1:142
3	C	2	157	1:79
4	D	5	827	1:165
5	E	4	486	1:122
6	F	4	728	1:182
7	G	3	328	1:109
8	H	5	695	1:139
9	I	5	442	1:84
10	J	1	136	1:68
11	K	2	452	1:226
12	L	4	654	1:164

Source: Field Data

Interviews with stakeholders demonstrated the poor performance in English was related to staffing too. As it was demonstrated in table 3, the teacher-student ratio clearly indicates the shortage. We had schools with a language teacher to more than 200 students which is quite high.
The respondents decried high teacher-student ratio. They lamented that given that English language is marked daily, the high teacher-student ratio makes them shy away from giving and making assignments with no adequate staffing against student numbers. A teacher said:

> *We have a high enrolment … the numbers are so high so you can have a class of 60-70 and marking becomes a problem*

Another teacher added that:

> *There is congestion in classes with some classes having 90 students in a stream which limits composition marking so we rarely give composition task (KII with subject teacher)*

From these findings, there is a real challenge of understaffing in schools in English. These findings agree with (Muchiri, 2009) argues that the challenges of handling large classes compounded by acute shortage of teachers puts a strain on the teachers' ability to provide quality language work to the learners because the teacher–learner ratio is not proportional. Further, (Glasson, 2009) observes that individual attention in the teaching of learners with diverse needs is compromised because of teachers' workload when the classes are crowded.

Staffing levels, enrolment and performance in Mathematics

Table 4 presents the teacher student ratio in Mathematics. From the table the only schools which are almost near the average teacher student ratio observed by TSC are Three; school (C) 1:52 school (E) 1:69 and school (J) 1:68. Though the ratios are around the average by TSC of 1:60 (Waihenya and Nyamai (2019), they are below the recommended ratio of 1:45.

Table 4: Teacher Student Ratio in Mathematics in 2020

SN	School	Total Mathematics teachers per school	Student Enrollment	Teacher student Ratio
1	A	8	729	1:91
2	B	5	425	1:85
3	C	3	157	1:52
4	D	9	827	1:92
5	E	7	486	1:69
6	F	7	728	1:104
7	G	3	328	1:109
8	H	5	695	1:139
9	I	5	442	1:88
10	J	2	136	1:68
11	K	5	452	1:90
12	L	4	654	1:164

Source: Field Data

Qualitative evidence coupled with onsite observations revealed that the teacher factor was also responsible for the low students' achievements in Mathematics subject. In many instances, the teachers of Mathematics in the sampled schools confessed that they lacked capacity in innovative pedagogical approaches, especially the aspect of integrating ICT in teaching. An example of the feedback on extent of integration of ICT in teaching Mathematics is reflected in the voice hereunder:

> *To be honest, we rarely use ICT in teaching Mathematics. Besides lack of infrastructure, the skills are limited on our part as teachers. (**KII with teacher of Mathematics)***

Furthermore, interview data indicate that there was low motivation among some teachers of Mathematics. This was attributed to an unconducive working environment and limited support from the employer. For instance, one teacher noted:

> *The working condition in the sub-county schools is demoralizing. The reward isn't commensurate to the work we do here. (**KII with teacher of Mathematics)**.*

Whereas the voices of teachers of mathematics in here attribute the poor performance to lack of capacity to integrate ICT in learning and the question of morale due to poor working conditions, beneath this is the issue of staffing. Many schools cannot procure equipment to utilize in instruction when there is a staffing gap. Any BOM would rather hire a teacher before procuring equipment. The poor working conditions are mostly as a result of the financial strain the schools are going through as they have to hire teachers, mostly on BOM terms which are not the same as the TSC terms and this can be a source of frustration among the BOM teachers hence the demoralization reported here. Mbugua, *et. al.,* (2012) observe that poor performance in Mathematics is as a result of; under staffing, inadequate teaching/ learning materials, lack of motivation and poor attitudes by both teachers and students, retrogressive practices. This argument is confirmed by studies by (Bunyi, 2004; Wambui 2005; Amunga and Amadalo, 2011; JICA, 2013; Karigi and Tumuti, 2015; Katiambo, Wasike and Musotso, 2018). To realize improvement in the performance in Mathematics, there is a need to ensure schools are adequately staffed and they have the skills to utilize a variety of teaching methods.

Staffing levels, enrolment and Performance in Biology

Table 5 presents the teacher student ratio in Biology. As observed in Mathematics none of the schools had the recommended teacher student ratio. As observed in this table, poor performance in Biology is attributed to teacher related factors of understaffing.

Interviews with stakeholders attested to this also; poor academic performance in Biology was influenced by teacher-related factors such as inadequate number of trained teachers, poor teaching methods that are theory-laden with very few practical sessions. In many schools, teachers seemed demotivated and with a negative attitude. They were teaching very many lessons and hence did not pay close attention to students. A good number of schools (8 out of 12) were understaffed as demonstrated in table 5 Furthermore, in ALL schools there were many Board of Management teachers who were on contract. Upon employment by the Teachers' Service Commission, they are usually posted elsewhere. The turnover of such teachers is therefore very high. The implication is disruption of the smooth flow of the teaching and learning process, leading to inconsistencies.

Table 5: Teacher Student Ratio in Biology in 2020

SN	School	Total Biology teachers per school	Student Enrollment	Ratio
1	A	7	729	1:104
2	B	5	425	1:85
3	C	2	157	1:79
4	D	5	827	1:103
5	E	6	486	1:81
6	F	5	728	1:146
7	G	3	328	1:109
8	H	8	695	1:87
9	I	4	442	1:111
10	J	2	136	1:168
11	K	4	452	1:113
12	L	5	654	1:131

Source: Field Data

Staffing levels, Enrolment and Performance in Chemistry

Table 6 presents the teacher student ratio in Chemistry. Like in Biology, the situation is equally bad in Chemistry as the least teacher student ratio is in school (E) where one teacher handles on average Ninety Seven (97) students.

Table 6: Teacher Student Ratio in Chemistry in 2020

SN	School	Chemistry teachers	Student Enrollment	Ratio
1	A	5	729	1:146
2	B	4	425	1:106
3	C	1	157	1:157
4	D	6	827	1:138
5	E	5	486	1:97
6	F	5	728	1:146
7	G	2	328	1:164
8	H	4	695	1:174
9	I	4	442	1:111
10	J	1	136	1:136
11	K	3	452	1:151
12	L	4	654	1:164

Source: Field Data

Qualitative evidence gathered through interviews affirmed there was understaffing in Chemistry; that student achievements in Chemistry was impeded by the challenge of inadequate trained teachers and lack of laboratory assistants. The data indicated that some schools only had one teacher of Chemistry and no laboratory assistant at all. For instance, in one of the interview sessions a teacher noted:

*I am the only trained teacher of Chemistry in this school. I have no laboratory assistant. Planning for instruction becomes a major headache (**KII with teacher of Chemistry)***

Another teacher of Chemistry remarked:

"How can one teach practical to a large class? You need to group them in groups of 4 or 5 but in my class I have groups of over ten. Some students give up and do nothing" **Teacher Chemistry.**

More interview data indicate that a number of teachers of Chemistry lacked capacity in innovative pedagogical approaches, especially the aspect of integrating ICT in teaching. The teachers however acknowledged that integration of ICT in teaching of Chemistry has the potential of bridging the gap. Ogembo (2013) observes that inadequate use of resources in the teaching and learning process and negative socio-cultural factors as well as inappropriate learning environment were some of the causes of the students' persistent poor performance in Chemistry in Kwale County, Kenya. This confirms the question of teaching resources. Generally unavailability of teaching resources is caused by lack of adequate finances some of which are diverted to hiring teachers because of understaffing as demonstrated in the staffing ratios in Chemistry in the schools.

Staffing levels, Enrolment and Performance in Physics

Table 7 presents data on teacher student ratio and performance in Physics. Some improvement in the teacher student ratio was observed in some schools as one school had a teacher student ratio below the expected ratio of 1: 45. School (B) had a ratio of 1:34. This may have been the case because the school was newly established and its population was still growing. Secondly, Physics was an optional subject in many schools including this school.

Table 7: Teacher Student Ratio in Physics in 2020

S/NO	SCHOOL	Student Enrollment in Physics by form					No. Teachers	Ratio
		1	2	3	4	Total		
1.	A	216	190	40	64	510	2	1:255
2.	B	46	47	06	04	103	3	1:34
3.	C	232	252	16	15	515	3	1:171
4.	D	97	152	16	07	272	2	1:136
5.	E	103	142	29	23	297	4	1:74
6.	F	222	164	15	45	446	4	1:112
7.	G	105	75	20	19	219	3	1:73
8.	H	179	207	31	82	499	4	1:125
9.	I	95	105	28	14	242	3	1:81
10.	J	45	35	06	09	95	1	1:95
11.	K	158	126	24	13	321	1	1:321
12.	L	195	185	31	25	436	2	1:218

Source: field data

The study revealed that understaffing in Physics, teaching methods used and teaching resources also affect performance in Physics hence resulting in low enrolment as a ripple effect. Many teachers in many of the schools visited teach physics conventionally through lecture method, a method which is a heavily teacher-centered mode of content delivery. It was also revealed that some concepts and topics are very abstract, thus so demanding in terms of practical lessons. Furthermore, resources are limited to conduct practical lessons, hence the dependence on lecture method of instruction. However, in three out of the selected 12 schools, physics performed better than the rest of the sciences. This was due to the teachers of physics integrating ICT in their teaching. However, they noted that there was inadequate or lack of digital content. The teachers rely on networking with and borrowing the content from teachers in other schools. Below is a conversation with one of the teachers who integrate ICT in teaching physics.

Teacher 1: *"I use my laptop to teach physics"*
Interviewer: *"So where do you get digital content to teach physics?"*
Teacher 1: *"I borrow digital content and save on an external hard disk to teach my students, who really love the subject. It is the best performed subject, with a mean score of 5.6 in last year KCSE"*

However, the study further revealed that many teachers are ICT compliant but do not integrate ICT in their teaching and the few who attempt have difficulty in selecting digital content. This is further complicated by lack of ICT infrastructure. The Government directive of 100% transition from primary to secondary schools has resulted in large class sizes particularly in current form 1 and 2 classes against very few teachers. Teachers tend to be overloaded with many lessons and resort to teaching to the examination. Undertaking practical lessons becomes a problem due to these large classes. Many teachers interviewed expressed their frustrations as exemplified by their own voices:

Teacher: *"It is very frustrating to teach a class of 60 plus. You are expected to set up experiments for the students. How do you do it with 60 plus students? To make matters worse, the apparatus are not enough. It is very frustrating."*

Staffing levels, Enrolment and Performance in Computer Studies

Table 8 in this study presented the teacher student ratio in Computer Studies. From this table it is clear that not all schools offered computer studies. Only five schools offered this subject. It was reported that computer studies was an optional subject and that most of the schools did not offer it. From the interviews with the BOM, Parents representatives and principals, computer studies was capital intensive and many schools could not afford to invest in the subject. It was also reported that most schools did not have power source backup and whenever there were power outages, it was not possible to offer the lessons. In the schools where the subject was offered, it was also reported that there were also challenges of internet connectivity.

Table 8: Teacher Student Ration in Computer Studies in 2020

S.NO.	School	Student Enrolment in Computer Studies by Form				Total Enrollment	Teachers	Ratio
		1	2	3	4			
1.	A	238	200	0	0	438	1	1:438
2.	E	103	142	0	0	245	2	1:123
3.	F	38	62	31	13	144	2	1:72
4	G	94	105	84	45	328	1	1:328
5	H	179	207	0	0	386	1	1:386

Source: field data

In terms of performance, the study established that the schools that offered computer studies were faced with two major teacher related challenges: There were inadequate number of teachers of computer studies and lack of trained teachers of computer studies. For instance, in one of the schools, there was only one untrained teacher hired on BOM terms handling students in both forms one and two with the student population of 238 and 200 respectively. Evidently from this staff student ratio, individual attention was compromised during instruction. The situation in Computer studies confirms what (Lukalo, 2009 and Guest writer, (2011) observed.

CONCLUSIONS AND RECOMMENDATIONS

From the findings, it was established the percentage of male to female teachers in STEM and English was high, it was concluded that there were more male teachers in STEM and English teachers in the schools. It was established that almost in the schools there about 65% of teachers employed by the TSC. It was thus concluded that schools were not adequately staffed as it is required. Out of the findings that the student teacher levels were high, it was concluded that there was understaffing in the schools. Out of the conclusions it was recommended that there was need to train more female English and STEM teachers to serve as role models for many girls who do not take STEM related careers at tertiary education level. There is a need for the TSC to employ more teachers to

relieve the schools from employing teachers and concentrate to finance other aspects in the schools such as infrastructure development and purchase of instructional materials and equipment. There is a need to reduce the teacher student ratio to the recommended levels through observing the approved staffing norms of about 1:45 to enable teachers to employ more of the student centered learning methods to promote effective learning in English and STEM subjects. This would in turn impact on the academic performance in the schools.

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