Influence of Teacher staffing levels on quality of education in public day secondary schools in Embu County, Kenya.

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Abstract

Amongst all educational personnel it is teachers who arguably play the central role of giving purpose to the learners and enthuse in them the drive to work hard so as to succeed in in life. By virtue of this vital function, number of teachers and their qualifications are key determinants of student's test scores, completion rates, enrollment rates, repetition and dropout rates as indicators of quality of education. The study envisioned to examine the influence of teacher staffing levels on quality of education in public day secondary schools in Embu County, Kenya. The study used correlational research design and targeted 192 principals, 1743 teachers and 35124 students from all the 192 public secondary schools in Embu County. Schools were stratified into the five Sub-Counties of Embu County. Public day secondary schools were purposefully sampled followed by another purposeful sampling of form four students. The study used a sample of 516 individuals comprising of 35 school principals, 97 teachers and 384 students. Data was collected using questionnaires, interview schedule and an observation checklist. The SPSS software was used to aid in data analysis. The study revealed that teacher staffing levels had strong correlation with quality of education. Chi-square statistics computed at $\alpha=0.05$ established a significant relationship between number of teachers and quality of education. The findings of the study revealed that public day secondary schools were understaffed pursuant to the curriculum based establishment. The study recommended that the government through the teacher service commission should employ more teachers to alleviate the shortage of teachers.

Key words: completion rate, curriculum based establishment, dropout rate, enrollment rate, quality education, repetition rate, staffing levels.

Introduction

Staffing level of teachers refer to the number of qualified teachers required for effective and efficient implementation of school curriculum. In any education system all over the world teachers duel the significant role to the improvement of the learning outcomes. However research show that in many countries educational institutions are faced with the problem of shortage of teachers. A study by Dijkslag (2019) in Netherlands found that teacher shortage had negative impact on test-scores for all students who took the National grade 8 test. The study established that an increase of teacher shortage at school level with 10 percent points reduced students test scores with approximately 0.06 standard deviations. When a learning institution experience shortage of teachers, then definitely it is a serious obstacle in the course of goal attainment and advancement. Teacher shortage exacts unnecessary pressure on teachers by adding more responsibilities including handling overcrowded classrooms. An overloaded teacher has limited time to handle individual attentions of each student, may find no time to give and mark assignments and provide feedback to students. As a result students' academic performance is compromised. According to a survey by the parliamentary Institute of Cambodia (2016) on the progress and challenges in Basic education, teacher shortage and absenteeism in rural and remote areas had a serious impact on grade stagnation and dropout. In the school year 2015-2016 the dropout rate in lower secondary was 19.2 percent which was a decrease from 21 percent in 2014-2015 school year. In some areas grade repetition rate was above 10 percent in the school year 2011-2012. More teachers were retiring than those who were starting teacher training and others were exiting the profession for better pastures creating teacher shortage. As a result rural schools had overcrowded classrooms. The classroom environment was not conducive for meaningful teacher-learner interaction. It was difficult for teachers to control students in

overcrowded classrooms. Stress and burn-out from high workload and responsibilities was cited as the cause of frequent teacher absenteeism. Frequent teacher absenteeism results to loss of interest in schooling among students with some eventually withdrawing from schooling.

In a study by Samuel (2017) in Kathiani Sub-County, Kenya teacher shortage had a great effect on grade stagnation and dropout. The study found that cases of dropout and grade repetition were more prevalent in rural schools where problem of teacher shortage was more pronounced. When teachers are inadequate some classes may go unattended or out of exhaustion from the high workload and responsibilities the teacher may just give out an assignment and take time to relax. In such a scenario students learn little and are likely not do well to be promoted to the next grade. Others get disinterested with schooling and may contemplate absenting themselves or even drop out. In another study by Mabeya (2019) in Kenya teacher shortage arising from teacher attrition lead to decline in Kenya certificate of secondary education (KCSE) mean score in Uasin-Gishu County. The study established that when attrition moved from 25 teachers in 2012 to 45 teachers in 2016 the KCSE mean score dropped by 1.8 points. According to the study when some teachers leave those who were left had to combine classes resulting in overcrowded classes. It was difficult to assess students work and offer personal assistance to slow learners. The students also found it difficult to write in congested sitting arrangement.

Thus the available number of teachers and their qualifications in an education system or learning institution is such paramount in determination of quality of education. The study sought to examine the influence of teacher staffing levels on quality of education in public day secondary schools in Embu County.

Statement of the research problem
In an effort to improve on quality and access to secondary education, the government of the Republic of Kenya has implemented various measures. The measures include recruiting new teachers to replace those who leave the service through natural attrition and those who leave for greener pastures. Contracting of internship teachers by the teacher service commission is also aimed at mitigating teacher shortage. In addition the government continues to strengthen the capacities of school managers through the training at Kenya Education Management Institute-KEMI. Learner capitation was increased from Ksh 12,870 to Ksh 22,244 to make secondary education more affordable to many Kenyan children. Other measures include adoption of elaborate policy on information, communication and technology (ICT) in education to guide in its integration in education. This initiative was aimed to improve on the efficiency and effectiveness of curriculum delivery, improve on education governance and management, and enhance delivery of quality and relevant skills.

Despite these efforts Kenya secondary education continue to face a number of challenges. For example the Global partnership report for education in Kenya (2019) shows that the country falls short of the required number of teachers to serve in all the schools. Some learning areas like sciences and technical are the most affected as qualified teachers in these subjects are in short supply. The report further indicates a financial resource gap of US$ 283 million needed to support education sector, particularly in financing of the free day secondary education. Other challenges facing the secondary education include challenges of educational wastage out of class repetition and drop-out mainly due to diverse factors, such as the range of user charges being levied and child labour that impact negatively on school attendance and participation.

Statistics on education attainment in Embu County indicate that for the period 2016-2019 only 17.1 percent of students attained the minimum grade of C+ to join public Universities. Meanwhile during this period 60.3 percent of students attained grades of D+ and below. In 2014 and 2016 the county enrolled 12,099 and 12,885 form one students respectively and in 2017 and 2019 the students who registered for the final exams were 10,653 and 11,593. This indicates education wastage either through grade repetition or dropping out of school. As such the motive of the study was to examine the influence of teacher staffing levels on quality of education in public day secondary schools in Embu County.

Theoretical framework
The study was guided by the Education production function theory. The theory was first used in the Coleman report in the US to analyze the role of school resources in determining achievement (Coleman, 1966). Since then the limits, controls and ranges that describe it have extensively been developed by its proponents such as (Bowles, 1969; Hanushek, 1979; Levin; Katzman, 1971; Angrist & Lavy, 1999). While vast majority of

studies measure output by use of test-scores, a few have considered other measures such as enrollment rates and dropout rate, repetition rates, and completion rates (OECD, 2007; UNESCO, 2005; World Bank, 2008). Similarly the school inputs used in simple analysis includes measures such as teacher staffing levels, basic school infrastructure, instructional materials and educational funds. Other studies have also included objective measures outside of education such as family size and occupation of parents. Due to the varied nature of the educational inputs there is no common ground on which inputs certainly influence particular set of learning outcomes (Percel & Menaghan, 1994). An education production function can be defined as follows:

$$Q = f(x_a \ldots x_m, x_n \ldots x_p, x_q \ldots x_z), \text{ Where}$$

Q represents a set of learning outcomes such as academic performance, completion rate, enrolment rates, dropout rate and grade stagnation;

$x_a \ldots x_m$ represents educational resources within learning institutions which include the staffing levels, physical facilities, teaching and learning materials, and financial expenditure;

$x_n \ldots x_p$ represents variables that define the situations and circumstances influencing the process of teaching and learning outside the school such as educational level of parents, the occupation of parents, and family income levels;

$x_q \ldots x_z$ represents variables that gauge the entry behaviour of the learner including what the learner had previously learnt, learning ability, and the socio-cultural influences.

According to Education production function theory education is equivalent of an industry that which when supplied with raw materials (educational resources) it transforms (process of teaching and learning) them in to final products (educational outcomes). The quantity and quality of the raw materials and the efficiency and effectiveness of the process determines the quantity and quality of the final products. In other words if an education system or institution is provided with adequate quality resources then with efficient and effective teaching and learning process desirable quality educational outcomes will be realized. Otherwise with inadequate poor quality educational resources and with inefficient and ineffective process the end product will be undesirable and of low quality.

Literature review
Teachers not only form the fundamental part of an education system but are also the stanchions of the education structure as well. The critical role of teachers in the educational experience of the learners pre-determines their level of success in life. Taking this into consideration the quality of educational attainment of learners is dependent upon the adequacy level of teachers and their qualifications. The number of qualified teachers available influences a number of measures which point out the quality of learning including class-size, pupil-teacher ratio, workload, and amount of productive learning time. Effective educational policies on staffing levels are thus essential to the implementation of educational plans.
According to a study by Ronfeldt, Loeb and Wyckoff (2012) in New York City, frequent teacher turnover resulted in teacher shortage and negatively affected the performance of students. For example the scores in mathematics were 6.1 to 7.9 percent of standard deviation lower in years when there was high percentage turn-over of teachers as compared to when there was none at all. Staff turn-over disrupts the coherence of school instructional programmes and the quality of trust among teachers and between teachers and students. In some instances students learn less when teachers leave and are not immediately replaced and this creates a void where students go unattended for some days.

According to the Pennsylvania's department of education (2019) teacher turnover in Harrisburg school district had detrimental effect on students test scores. The district was ranked among the bottom. For instance in 2017-2018 school year only 7.1 percent of students scored proficient and above in algebra against the State average of 45.5 percent. The report indicated that some teachers left without being replaced and students would miss lessons. Some schools ended without certified mathematics teachers to offer daily thorough teaching and exposure. In many schools where teachers had exited without replacements the students were taught by part-time untrained substitutes. When students are taught by unqualified teachers the quality of learning gets compromised as the teacher may fail to deliver as per the needs of the learners. Students may become disinterested; develop a negative attitude towards the teachers and the subject as well.

According to the OECD (2016) report of analysis of the PISA results, students in schools with higher incidents of shortage of teachers had 0.23 probability of attaining low scores in mathematics. This was even after holding constant the socioeconomic positions of both the school and the student across all the countries of OECD. The scenarios reported in cases of teacher shortage included missed lessons, unmarked students work, large overcrowded classes among others. Teachers being the key instruments of impacting knowledge and skills, and in the attainment of desired values and attitudes by the learners, in a missed lesson there was no learning that took place. This is because learners need to be told new things and how to do them. Teacher's feedback on students work serves to communicate, guide and encourage the student to do more. In overcrowded classes the feedback is not guaranteed as the teacher time for each student is reduced and or may not be available altogether.

In a review of the public expenditure on education in Jamaica by the joint efforts of the World Bank and UNICEF (2021) pupil-teacher ratio was correlated to the academic performance of the learners. The pupil-teacher ratio in secondary schools was 25:1 which was higher than of the neighbouring Caribbean countries. From the analysis of the review an addition of a student per teacher lowered the chances of attaining an advanced level in English language and mathematics by 1 percent point. The increase in pupil-teacher ratio was often caused by emigration of teachers causing a shortage especially in mathematics and sciences. The review also established that the presence of a qualified teacher with a bachelor degree correlated to improved academic performance of students. However in rural areas the ratio of pupil to a graduate teacher with a bachelor degree was as high as 100:1 due to inequitable distribution of teachers. This implied that students in rural schools had very low chances of excelling academically as large class-size suggest heavy workload for teachers. With large class-size teachers have limited teaching methods due to available physical space and resources and as such the method applicable may not be in favour of quality teacher-learner interaction. Individualized instruction as per the needs of the learner proves difficult in large class-sizes.

The educational statistics by the Afghanistan Research and Evaluation unit (2013) show that the number of girls' enrolment at elementary school is half that of the boys while at secondary level this number drops to a third that of the boys. Noori (2017) highlights lack of female teachers as one of the main reasons for low enrolment of girls as less than 20 percent of all teachers were females. The mothers feel more comfortable when their daughters are taught by female teachers. Female teachers acts as role models and encourage girls to enroll and successfully complete their studies. Girls also feel safe when confiding their personal problems to female teachers who can offer protection from unwanted attention by boys and male teachers (Kirk, 2006).

In a study by Hoque and Mahanta (2021) that examined the role of a teacher in improving quality of education in 40 developing countries, pupil-teacher ratio had statistically significant and positive impact on dropout rate. The study established that reducing class-sizes by recruiting more teachers led to reduction in dropout cases. When students are few in a class the teacher is able to have a one-on–one instruction with individual learners in a manner that would not work in overcrowded classrooms. When individual needs of a learner are met s/he feels motivated to learn; especially those at risk of dropping out due to low test scores. Small class-sizes also reduce workload for the teachers giving them more time to offer other services like guidance and counseling students who may be at risk of dropping out due to indiscipline or teenage pregnancy among other issues.

According to UNICEF (2019) teacher shortage in Madagascar was such serious that average class size had over 68 students. This had negatively impacted on academic achievements and completion rates. More than 50 percent of children completed the primary level without the basic skills in mathematics and French language. Out of 100 children who enrolled in primary, only 40 completed the cycle, 20 completed middle school and 10 completed secondary school. An earlier study by Wills, Reuter, Gudiel, Hessert and Sewall (2014) in Madagascar found that the large class-sizes were difficult for teachers to handle and this led to poor learning outcomes. Subsequently children with low test scores were forced by the system to repeat classes and this worked against completion rates. Qualification of teachers especially in primary school was wanting as a large number of them had not completed high school. Such teachers lacked the competence in teaching and this affected quality of content delivery.

According to a study report by Marchetta and Dilly (2019) in Burkina Faso teacher shortage due to challenges in teacher recruitment had considerable effects on repetition, dropout, transition, and completion rates. Completion rates were as low as 65, 24 and 9 percent in primary, lower and upper secondary respectively. The low completion rates were as a result of grade repetition and dropout cases which were attributed to academic

failure. In particular the study noted that in the 2017 school year 28 percent of learning time was not taught due to lack of teachers in some areas. When instruction time is lost the syllabus will likely not be completed by exam time and as a result academic performance will be dismal and may lead to grade repetition, disinterested in schooling and or even dropout.

The Eritrean education sector analysis report by the Ministry of Education (2017) indicated that insufficient number of qualified teachers in rural schools was an obstacle to secondary education achievements. The constraint in teacher training and recruitment was compounded by high rate of teacher attrition particularly in rural areas. In 2012/13 academic year alone 1,306 teachers quit from teaching. The report highlights that in the period 2013-2017 the country had a shortage of 1865 teachers at lower secondary with rural areas being the most affected. Dropout rates were lower and grade progression was higher in school located in urban areas. In urban centers schools had relatively sufficient teachers owing to low attrition and high retention of teachers courtesy of better social amenities. In rural areas most teachers were unqualified; some teachers were teaching subjects which they had not trained in thereby compromising the quality of delivery and of the content learnt. Favour (2012) points out that unqualified teacher recite the materials in the text book and require the students to memorize in order to pass their exams. Unqualified teacher also lack knowledge and self-confidence in managing classes that entertain diversity of opinions which discourages students from thinking critically. Teacher absenteeism was also high and this reduces time for instruction and thus students learn less. Big class sizes and heavy work load in remote areas worked against teacher quality time for individual learner.

According an education assessment report by Windle Trust (2017) in South Sudan teacher factor had greatly influenced students' enrollment, dropout and academic achievements in secondary schools. For example in 2016 the average dropout for girls was 15 percent while for boys it was 8 percent. The high dropout for girls was attributed to shortage of female teachers who accounts for only 14 percent of the teaching force. In rural areas the percentage of female teachers was much less. Secondary school girls are at a very sensitive age of their development and in the absence of female teachers whom they can confine to or seek assistance the girl may feel insecure being in school. The parent may also be reluctant to send their girls to schools dominated by male teachers. The problem of teacher shortage was compounded by the fact that only 56 percent of the teachers were trained; more than 25 percent were untrained and the professions of the rest were not known. This had negative impacts on the effectiveness of content delivery due to lack of appropriate pedagogical skills. Owing to delayed salaries for as many as 8 months and insecurity some teachers had exited the profession leading to acute shortage of teachers in some regions. The shortage had led to overcrowded classes in which teachers had difficult meeting the need of individual learners.

In Kathiani sub-County, Kenya a study by Musyoka, Cheloti and Maithya (2018) established a significant and a positive relationship between teacher adequacy and academic performance. A majority of the respondent principals disagreed with a statement that their schools were sufficiently supplied with teachers as per the curriculum based establishment. Adequate teachers translate to small and manageable class sizes that allow the teacher to attend to every student; students behave better and are more attentive. According to this study, when teachers were increased by a unit, academic performances of the students tend to increase by 0.6 of a unit.

Materials and Methods
Research Design
Research design refers to the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Kothari, 2004). The study used correlational research design.), in correlational research design the researcher is interested in the extent to which two variables (or more) co- vary, that is where changes in one variable are reflected in changes in the other (Creswell, 2012). The design is cost effective as it allows the researcher to collect much more data and is less time consuming. Its methodology and statistical analysis are easy to implement. It also allows the determination of the strength of the relationship between variables in their realistic settings which can really help in predicting causal relationships. The design was thus deemed appropriate in analyzing the influence of teacher staffing levels on quality of education in public day secondary schools in Embu County.

Target population
The study had a target population of 37,059 individuals consisting of 192 school principals, 1,743 teachers and 35,124 students-all drawn from public secondary school in Embu County.

Sampling procedure and sample size

The schools were first stratified into the five sub-Counties of Embu. Public day secondary schools were then purposefully sampled followed by another purposeful sampling of form four students. According to Bullen (2014) a good maximum sample size is 10 percent as long as it does not exceed 1000, while in the views of McMillan and Schumacher (2001) sample sizes of 20 percent is representative enough. Based on the above arguments, the researcher randomly sampled 20 percent and 10 percent of principals and teachers respectively. Cochran's formula (1963, 1975) was used to determine the sample size of students.

$n = \frac{z^2 pq}{d^2}$ Where,

n is the desired sample size,

z is the standard normal deviation set at 1.96 which corresponds to 95 percent confidence level,

p is the proportion in the target population to have a specific attribute,

q is 1-p, and,

d is the absolute precision set at 0.05

Upon substitution;

$n = \frac{1.96^2 \ (0.5)(0.5)}{0.05^2}$ = 384 students.

The sample size of each stratum was kept proportional to its population.

The Sample sizes are shown in Table 1

Table1. *Sample sizes for the principals, teachers and students*

Sub County	Principals			Teachers			Students		
	N	n	n-s	N	n	n-s	N	n	n-s
Embu East	34	7	1	218	22	3	848	75	11
Embu West	25	5	1	198	20	4	792	70	14
Embu North	23	5	1	172	17	4	838	74	15
Mbeere North	43	9	1	186	19	2	916	81	9
Mbeere South	45	9	1	202	20	2	956	84	9
Total	170		35	976		97	4347		384

Key: **N** = Sub-County population, **n** = sample size, **n-s** = respondents per school

From Table 1 the study used a sample size of 516 individuals consisting of 35 school principals, 97 teachers and 384 students.

Research instruments
The data for the study was garnered using questionnaires and interview schedule. According to Mills, Durepos and Wiebe (2012) studies that use different research instruments are considered to be of higher quality. This is because by triangulating data from different instruments, the raw biases that arise from the use of a single instrument are eliminated. Data from different research instruments also provide the researcher with an overly integrative cognition of the phenomenon and also increase the confidence in the results of the study. There were two different questionnaires, one for the teachers and the other one for the students. Interview schedule was used to solicit information from the principals. Through asking questions and probing the answers from the principals the researcher was able to collect in-depth information on staffing levels.

Validity of the instruments

The concern with validity is the authentication of the findings of a research and to ascertain if the research examines what it is supposed to examine (Zohrab, 2013). Extensive and thorough review of related literature was carried in search of the relevant items of the instruments. The instruments were then checked by the two supervisors of the research. Their feedback assisted in modifying the instruments; some questions were revised and complicated words were also revised for ease of understanding.

Reliability of the instruments

In research reliability focuses on the precision, genuineness and replicability of the findings (Nunan, 1999). According to Weiner (2007), reliability is the soundness of an assessment criterion in producing identical results with subsequent application. The reliability of the instruments was determined by carrying out a pilot study. Four public day secondary schools, one from each sub-county, were randomly selected for piloting but which were not to be included in the actual study. Principals in the four schools were automatically included in the pilot study while 9 form four students per school were randomly selected to fill the questionnaire. Ten teachers from the four schools were randomly sampled in the ratio [3:3:2:2] to fill the questionnaire. After 21 days the researcher collected another set of data from the same respondents in the four schools. According to Kamta (2016) the time lapse between test-retest when determining reliability of research instruments should be not less than 15 days but rather should be between 15 and 30 days. However young children and old people can easily forget and therefore this time interval should be shortened. The two sets of data from the pilot study were carefully fed into the SPSS to test for their correlations. This was done using the Pearson's correlation coefficient product moment by use of Cronbach- alpha statistics. The tests yielded correlation coefficients of 0.79, 0.81, and 0.77 for the interview schedule, teachers' questionnaire and students' questionnaire respectively.

Data analysis procedure

The data was analyzed both qualitatively and quantitatively. First it was edited to detect errors and omissions and correcting where possible. This was followed by coding the responses by assigning them numerals in order to limit the number of categories and classes. Quantitative data was analyzed descriptively using the frequency tables and their percentages. For the qualitative data, after coding and after putting data into categories of common attributes as per the research objectives, analysis of the contents was informed by the meaning and the opinions of the respondents. Some of the narrative responses from the interview were transcribed and presented in raw form as narrated to capture the actions and feelings of the respondents concerning the staffing levels in their schools. The teacher staffing levels were correlated with dependent variables; namely academic performance, enrollment, completion, dropout and repetition rates in order to determine the strength of their relationships. Chi-square statistics at alpha value of 0.05 were then computed to enable the researcher to make inferences and predictions

Results and Discussions

Number of teachers

The study sought to establish if public day secondary schools in Embu were understaffed, overstaffed or had just the right number of teachers. This was to be ascertained from teacher turn over, workload and the employment status. The principals were asked if their schools were understaffed, overstaffed or had just the right number of teachers and their responses are reflected in Table 2

Table 2. Staffing level based on CBE

Staffing level	Frequency	percentage
Understaffed	23	88.5
Just have the right number	3	11.5
Total	**26**	**100**

The results in Table 2 depicts that most of the public day secondary schools in Embu County (88.5%) are understaffed; this means they had less number of teachers as per the curriculum based establishment. From

the interview session code IS-6 a principal said "*I have a serious shortage of teachers; my school is double streamed and I am supposed to have 19 TSC teachers as per the CBE but currently I have 12 TSC teachers. As a school we have engaged 4 teachers on BOM terms and we still need more.*" In another interview session code IS-23 the principal had this to say "*we are actually feeling the heat of the 100 percent transition policy; this year we started the third stream class in form 1 but the school has 15 TSC teachers, a number that is not adequate even for a two streamed school. Without BOM teachers the problem would be worse.*" The results concurs with that of Musyoka, Cheloti and Maithya (2018) who found that schools in Kathiani sub-County were in short of sufficient number of teachers. The teachers were requested to indicate the number of colleague teachers who had joined or left the school for whatever reason in the previous three years. The results are tabulated in Table 3

Table 3. Turnover of teachers

Number of teachers	Who have joined		Who have left	
	frequency	percent	frequency	percent
None	11	12	14	15
1-10	19	21	31	34
11-20	9	10	8	9
Total	**39**	**43**	**53**	**58**

According to Table 3, a higher number of teachers had left the schools compared to the number of teachers who had joined the schools in a span of three years. The resultant effect is shortage of teachers in those schools. The results are supported by responses from the interview with the principals. A principal in interview session code IS-19 said "*I had a very hardworking teacher of English who was promoted to deputize in a school in a neighbouring County at the beginning of this term. The term is almost coming to an end and she has not been replaced.*" In another interview session code IS-5 the principal reported "*Right now I have a very needy case because one of my science teachers was interdicted. I have requested a teacher from a neighbouring school to come and assist in preparation of end term exam practical.*" From the interview session code IS-16 the principal said "*last year one of my teachers moved to the public service and in June this year one teacher retired. So far only the one who retired has been replaced.*"

If the number of teachers who leave a school does not balance with the number of teachers that join the school, understaffing or overstaffing can arise.

To verify this assertion of understaffing the teachers were asked to indicate their weekly load and the data is reflected in table 4

Table 4. Teachers' weekly load

Weekly load	Frequency	Percentage
Below 18	1	1.1
18-22	11	12
23-27	29	31.5
28-32	49	53.3
Above 32	2	2.2
Total	**92**	**100**

From Table 4, a majority of teachers (55.5%) had a weekly load of 28 lessons or more. This implies that based on the minimum workload of 27 as per the CBE the workloads were manageable. However from the interviews, the principals indicated that they had engaged teachers on board of management terms which probably had brought the workload to manageable levels. It was thus prudent to obtain data on the employment status of teachers to find out if really there were teachers contracted on board of management terms. The data is as depicted on Table 5

Table 5. Employment status of teachers

Employment status	Frequency	Percentage
Permanent and pensionable	63	68.5

Employed by school board of management	25	27.2
Others	4	4.3
Total	**92**	**100**

Table 5 shows that more than 27 percent of teachers were not employees of the teacher service commission. A majority of these teachers were employed by the schools board of management. The results confirm that schools engaged teachers on BOM terms to lessen crisis of teacher shortage. The findings are consistent with the work of Mabeya (2019) in Uasin-Gishu County, Kenya which established that the trend in teacher attrition was on the rise creating teacher shortage in the County. Teachers were leaving the profession for greener pastures, ask for transfer or left the service on early retirement. As a result schools engaged teachers on BOM terms to alleviate the shortage.

With regard to staffing levels the number of personnel would be of no meaning if they lacked the skills necessary to do their job tasks. The researcher sought to establish if teachers were trained in the subjects they were handling. This was ascertained through number of subjects outside ones area of specialization. The teachers were asked to indicate the number of subjects that they were teaching which they were not trained. The data is indicated in Table 6

Table 6. Number of teachers who were handling subjects outside their area of specialization

Number of subject not trained in	Frequency	Percentage
0	76	82.6
1	14	15.2
2	2	2.2
Total	**92**	**100**

According to Table 6, 17.4 percent of teachers were teaching subjects that they had not trained in. The result suggests that schools had employed unqualified teachers to fill gaps in teacher shortage. Unqualified teachers may teach the wrong content, they may be unable to handle large class-sizes, and they may be unable to vary the teaching methods to take care of the diverse needs of different learners.

The foregoing results on staffing levels ascertain that day secondary schools in Embu County are understaffed based on the CBE. Therefore it was prudent for the researcher to find out how staffing levels correlate with quality of education as informed by academic grades, completion rates, enrollment rates, repetition rates and dropout rates of students. Pearson correlation analyses were computed and the results are shown in Table 7. This was followed by computation of chi-square statistics to determine if the relationships between staffing levels and variables of quality education were statistically significant. The computed chi-square statistics are presented in Table 8

Table 7. Correlations between number of teachers and quality of education

		Y	X1	X2	X3	X4
Number of teachers-Y	Pearson Correlation	1				
	Sig. (2-tailed)	.				
	N	26				
Academic grades –X1	Pearson Correlation	.527	1			
	Sig. (2-tailed)	.321				
	N	26	26			
Enrollment rate-X2	Pearson Correlation	.416	.052	1		
	Sig. (2-tailed)	.102	.864			
	N	26	26	26		
Completion rate-X3	Pearson Correlation	.625	-.041	-.032	1	
	Sig. (2-tailed)	.413	.624	.647		
	N	26	26	26	26	
Dropout rate-X4	Pearson Correlation	.021	-.023	-.017	-.315	1
	Sig. (2-tailed)	.518	.703	.614	.684	
	N	26	26	26	26	26
Repetition rate –X5	Pearson Correlation	-.301	.024	-.016	.642	.021	1
	Sig. (2-tailed)	.327	.781	.075	.142	.713	
	N	26	26	26	26	26	26

*. Correlation is significant at the 0.05 level (2-tailed).

The results in Table 7 indicate positive correlations between number of teachers and academic grades [r =.527, p =.321], enrollment rate [r =.416, p =.102], and completion rate [r =.625, p =.413]. This suggests that increase in number of teachers in a school lead to better academic grades and improvement in enrollment and completion rates. The negative correlation between number of teachers and repetition rate [r =-.301, p =.327] suggests that increase in number of teachers lead to reduction in repetition rates. Correlation between number of teachers and dropout rate of students was found to be negative and very weak [r = -.021, P=.518].

Table 8. Chi-square statistics on the relationships between teacher staffing levels and quality of education

	Value	df	p-value
Number of teachers * academic grades of students	18.854 [a]	6	0.011
Number of teachers * enrollment rate of students	6.571 [a]	4	0.028
Number of teachers * completion rate of students	11.120 [a]	5	0.019
Number of teachers * dropout rate of students	0.950 [a]	7	0.496
Number of teachers * repetition rate of students	8.012 [a]	6	0.024

Table 8 shows the chi-square statistics of one single independent variable and the five dependent variables. The p-value of 0.011< 0.05 for the number of teachers and academic grades indicates a statistically significant relationship between the two variables. This implies that adequate staffing of schools is necessary for the

students to attain good and desirable academic grades. The p-value =0.028 < 0.05 for the number of teachers and enrolment of students shows that the relationship is statistically significant. This implies that the more the number of teachers in a given school the high is the capacity to enroll many students. The p-value =0.019 < 0.05 for the relationship between the number of teachers and school completion rate of students is an indication of a statistically significant relationship. The implication here is that the more the teachers in a given school the higher the chances of students completing their studies in the stipulated time. A p-value =0.0496 < 0.05 between number of teachers and dropout rate of students indicates is also significant relationship. This implies that dropout cases reduce with increase in number of teachers. The p-value =0.024< 0.05 between number of teachers and repetition rates of students shows that the relationship is statistically significant. This implies that students in schools with more number of teachers have lower probability of repeating a grade. The null hypothesis that there is no significant relationship between teacher staffing levels and quality of education in Embu County is thus rejected.

Conclusions

The study revealed that public day secondary schools in Embu County were understaffed. It was clear that schools employed teachers on B.O.M terms in their efforts to fill the gap of teacher shortage. It also emerged that some of the teachers were teaching subjects outside their area of specialization. The study established statistically significant relationships between teacher staffing levels and quality of education. The findings underscore the need by the government to employ more qualified teachers in her effort to provide quality secondary education.

Recommendations

The study recommends that the government through the teacher service commission should employ more teachers to alleviate the shortage of teachers. Concerning teachers handling subjects outside their areas of specialization, a mechanism need to be instituted, such as the one used in the recruitment of teachers by the teacher service commission to be used by schools management when contracting teachers on B.O.M terms. This will ensure that these teachers have the right and relevant qualification for the subject they are teaching.

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