European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.439136 Volume 3 | Issue 4 | 2017

THE IMPACT OF TEACHER CHARACTERISTICS ON PERFORMANCE IN SECONDARY SCHOOL SCIENCE SUBJECTS IN ELDORET MUNICIPALITY, KENYA

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Abstract:
The study sought to determine the impact of teacher characteristics on performance in secondary school science subjects in Eldoret Municipality in Kenya. Stratified random sampling was used to draw a sample of 14 head teachers, 49 teachers and 289 form three students. Stratification was based on the schools' performance in KCSE science subjects for the period 2001-2005 to obtain 7 low performing and 7 high performing schools. The purpose of the study was to find out the influence of teacher factors of: age, motivation, experience, competence, and methods of teaching on performance in sciences. The study was significant as performance in science subjects has been poor for a long time in Eldoret Municipality. Most students' score below grade C- in science hence do not proceed to do science–based careers. Data was collected using questionnaires. Descriptive statistics were used to analyse and summarise the data. T-test was used to test for significant differences between means of low performing and high performing schools. Correlation was used to show relationships between performance and the research variables. The findings showed that the impact of competence and motivation of teacher as well as teaching method was significant but other factors such as attitude, qualifications and experience of teacher were not significant.

Keywords: teacher motivation, competence, experience, teaching methods, attitude, performance

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1. Introduction

The problem of poor performance in science subjects is wide-spread as indicated by studies done by Valverd and Schmidt (1997) in USA, Landry (1998) in Canada and, Fonseca and Conboy (2006). This problem is made worse in developing countries by the existing digital divide, poverty and other problems unique to the third word. In Eldoret Municipality, performance in KCSE science subjects is poor as majority of the students score a below average mean grade (C- Minus) and below as shown in table 1.

Table 1: Uasin Gishu District KCSE Mean Grades in Biology, Chemistry and Physics for the Years 2001 to 2005

Year/Subject	Biology	Chemistry	Physics
2001	5.397	3.702	4.656
2002	4.910	3.795	5.618
2003	4.972	4.089	5.091
2004	5.884	4.171	5..350
2005	4.477	3.739	4.757

Source: Uasin Gishu District 2004 and 2005 Results (Editions for Education Day).
This bars learners from entry into science- based courses.

2. Teaching Methods, Teacher Qualifications, Competence and Teacher Development

According to Mukwa and Jowi (1988**),** laboratory and practical work techniques are highly suitable for teaching agriculture, social and natural sciences. In this method, the cause, effect and nature of the learning activity are determined by actual experience or experiment under controlled conditions. Students therefore learn skills and acquire knowledge in a real life setting. Other appropriate teaching methods are demonstration and direct experience as they provide students with concrete experience of real life situations. Fonseca and Conboy (2006) quoting Easton (2002) said that students in a residential high school in the USA were interviewed in order to determine perceptions of their learning needs. The needs they identified included personalized learning, teachers who care and active learning. They also quoted Wong et al (2002) who said that teacher behaviours that promote development of student autonomy were important.

Shiundu and Omulando (1992) state that in-servicing of teachers helps to acquaint the teacher with the latest innovations in curriculum hence enables them to cope with new demands. There is an on-going in servicing course named Strengthening of Teaching Mathematics and Science in Secondary Education (SMASSE) (KESSP, 2005-2010). However, the project has encountered problems of discontent from teachers over allowances and poor living conditions at the training centres (Kamau, 2005). The teachers also feel that the training will not make a difference if the other factors affecting performance are not addressed. (MOE-SMASSE Inset Report (2005 0, Uasin

Gishu District). Woessman (2001) revealed that higher training of teachers added more points to students' in science compared to teachers who had only secondary education. A bachelor's degree was found to add 12 more points while a masters or doctorate increased by 32 points in science. Study leave provision to teachers has encouraged many of them to pursue further studies. However, TSC does not give a substantial salary increment to those with masters or doctorate degrees. The Daily Nation (2007, July 10) shows the teachers' new pay package and indeed there is no mention of a scale for teachers with post graduate qualification. If Woessman (2001) findings are representative, then the government should pay teachers with qualifications above the bachelor's degree salaries that are commensurate with their qualifications so that they do not seek employment outside TSC. This would also motivate more teachers to undertake further studies. Kenya Union of Post Primary Teachers had this as one of their grievances against the government.

3. Attitude of Teachers and Students to Science Subjects

Shumbo (1993) found out that teachers' influence was a possible reason for impoverished attitudes towards science. The study found out that secondary school teachers in Harare lacked material teaching resource to use for hands on enquiry. This leads to poor understanding of the subjects. Hence the notion that the subjects are difficult arises, leading to a negative attitude. Science subjects are believed to be tougher than the humanities. Some learners and teachers believe that one has to have special abilities in order to do science (Fonseca and Conboy (2006), KESSP (2005-2010). The former found out in a research in Portugal that difficulty of content was ranked third among factors that students considered as causes of failure in science while the latter states secondary mathematics and science subjects face problems such as negative attitude (of teachers, learners parents and education managers). Some teachers discourage learners by telling them that science is not for every Jack, Dick and Harry (Litala, 2006). The case of negative attitude by education managers can be illustrated by what a director of Kenya Institute of Education once said: "*that it is possible to teach science without students performing experiments and this would save parents and the government the cost of school laboratories*" (The Standard , 2007).The same paper states that in many countries, the study of sciences is optional, and where it is taught, low academic achievement is seen hence there are not enough skilled teachers in Africa. Thus, almost all Africa universities are steeply skewed towards the humanities. This also applies to Kenya because in the 7-4-2-3 education system, some students would opt for the Arts and only do the compulsory sciences at ' O ' level then proceed to 'A' level for purely Arts combinations. For this reason, there were more Arts students than science students proceeding for higher learning. At the time, mathematics, physics and

chemistry (MPC) combination was referred to as 'the mad peoples' combination', which bore the connotation that for one to do those subjects, one had to have intelligence that is so high that it borders insanity. This tended to alienate sciences from learners who considered themselves not so clever. The situation has not changed with the 8-4-4 system. Sciences form the second cluster of subjects from which students are expected to choose two of the three sciences or do all. Rarely do students opt for all the three. Among the three sciences, physics is chosen by very few students. .

This grim scenario can, however, be improved if proper strategies are employed. Fonseca and Conboy (1999) reports of a study in which an intervention was adopted on physics students fraught with negative attitudes and repeated failure. Results of the intervention showed that continuous engagement of students within meaningful contexts in a supportive environment (characterized by personal commitment on the part of the teacher, high teacher expectancies and clear objectives and policies) can improve performance. An example is that of Thomas Edison-the father of modern physics. It is said that he was expelled from school because after three years he could not read or write. But at home, with encouragement from his mother, he was not only able to read and write but became an outstanding inventor with more than 1000 patents to his name. (The Standard, 2006)

4. Statement of problem

In Eldoret Municipality, performance in the Kenya Certificate of Secondary Education (KCSE) science subjects is very poor as majority of the students score C-.as shown in table 2. This bars learners from pursuing science- based courses at higher levels of education. Poor performance is partly attributed to certain characteristics of classroom teachers. Classroom teachers display many characteristics which affect academic performance but identifying significant predictors help in choosing the appropriate interventions aimed at improving academic performance. There was therefore need to determine those characteristics of teachers that are predictors of academic performance. Basing on this, the author examined the relationship between teacher characteristics or factors of: attitude, motivation, experience, competence, methods of teaching and performance in science subjects at the Kenya Certificate of Secondary Education.

4.1 Theoretical framework

The researcher investigated factors influencing performance in science subjects in the KCSE exam basing on the systems theory by Ludwig Von Bertalanffy (1928), whose application to organisations was proposed by Katz and Kahn (1966). A system is a collection of interrelated parts, which form some whole. This study considered schools as organizations, hence they are systems. Since schools depend on and interact with

their environment, they are open systems. A basic model of an open system is diagrammatically shown in below:

A Basic Model of a System Based on Systems Theory;

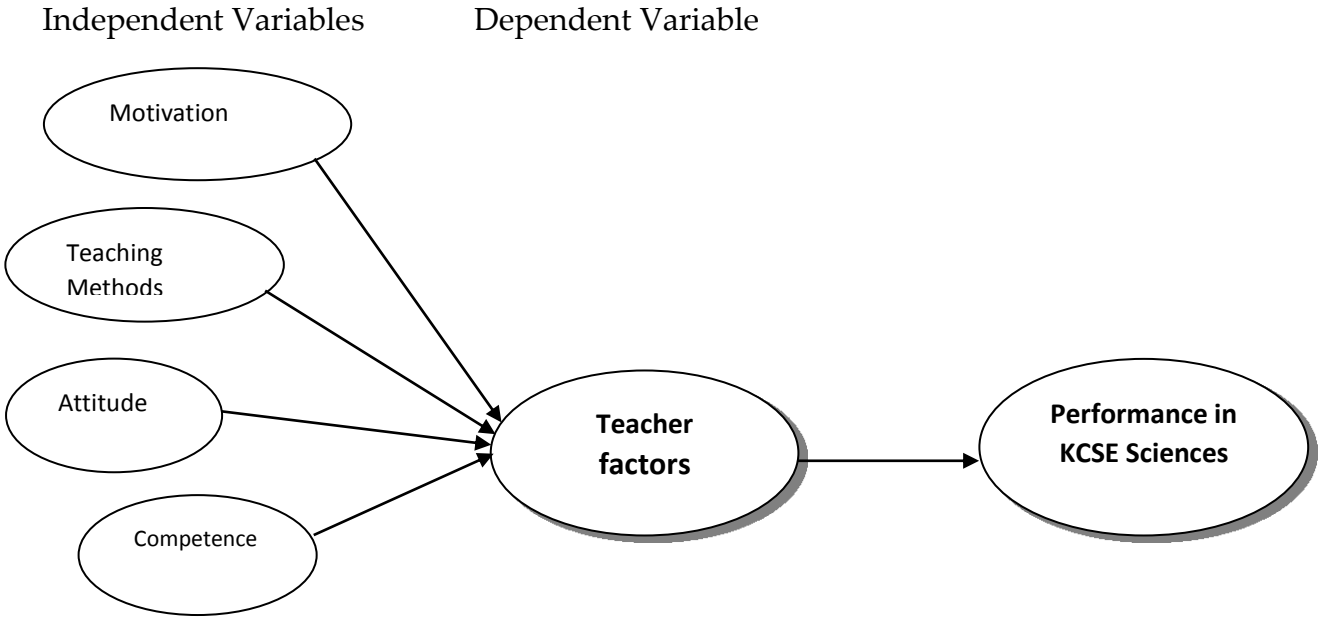
Source: Management, Cole (1993)

In relation to organizations (schools included), the inputs include people (for this study, teachers) materials, Information and finance. These are organized and activated so as to convert human skills and raw materials into products, services and other outputs, which are discharged into the environment. There is great inter-dependence between the system and its environment (Koontz, 1998). Likewise the components of the organization are inter-dependent (Cole, 1993). Therefore, if anything goes wrong in the environment or any of the subsystems, the other subsystems will be affected and this will affect the outputs. Likewise, inputs greatly determine the outputs. Relating the above argument to the school system, the science department can be considered as a subsystem within the school. The school has several other subsystems. These include the administration, personnel (teachers), finance, among others. Performance in science subjects is part of the outputs of a school system, and is therefore, affected by, not only what goes on in the science department, but also, in all the other departments.

Thus, basing on the systems theory, a conceptual framework was drawn, linking the independent and dependent variables as shown below.

4.2 Conceptual framework

Figure 1: Conceptual Model of Linkage between Systems Theory and School Performance in Science



4.3 Materials and Methods

Ex-post facto survey design was used. Both non-probability sampling and probability sampling techniques were employed. There were twenty-one secondary schools that were involved in the study. Of these, eleven (11) were private while ten (10) were public schools. The researcher purposively selected the top seven (7) and bottom seven (7) schools based on the overall 2001 to 2005 KCSE results rankings. All the Head teachers of the fourteen (14) schools were selected as informants but not subjects of the study. Four science teachers were selected at random in each school as well as twenty two (22) students from each school to give a sample size of 56 teachers and 308 students. Questionnaires and content analysis were the methods of data collection. The questionnaire involved closed-ended and open ended questions. Some of the closed-ended questions were scored on a Likert scale of 1 to 5 for responses such as strongly disagree to strongly agree. Document analysis involved sourcing secondary data on results of KCSE reports for the period 2001-2005 from the DEO's office as well as sampled schools Descriptive statistics as well as inferential statistical methods were used. The descriptive statistics involved computation of frequencies and means. The inferential statistics used were t-test and correlation. T-test was used to show if there were significant differences between the means of the low performing schools and the high performing schools. Correlation was used to find out if any relationship existed between performance in KCSE sciences results and the research independent variables namely: motivation/salary ,teacher attitude, competence and teaching methods at $p<0.05$ level of significance.

5. Results and Discussion

5.1 General Characteristics of Respondents and Informants

There were 49 teacher respondents, of whom 30 (68.2%) were male, suggesting that the teaching of sciences was a male dominated realm, hence lack of role models for female students. Most of the teacher respondents, 24 (53.3%) taught Biology. This could be attributed to biology being an integrating subject .That is, pairing up with either agriculture, geography, chemistry or mathematics while chemistry pairs up with only 3 subjects-biology, physics and mathematics and, physics pairs up with only 2 other subjects-mathematics and chemistry.

Most of the teachers 33 (71.7 %,) had a teaching experience of up to 10 years. The view that most of the teachers were fairly young and energetic though inexperienced was further confirmed from data on their age. Out of the 44 responses, 27 (61.4%) were below 35 years of age thus suggesting that they were energetic to teach sciences. However, due to their young age, many of them could be less experienced hence contributing to the poor performance in science. In response to a question on whether

the teachers were trained or not, all the teachers (n=49) responded that they were trained.

It was noted that 13 (28.3%) had a diploma, 27 (58.7 %) had a bachelor's degree, while only 6 (13.0%) were either working on their masters or had a master's degree. The study sought to investigate the relationship between teacher factors and performance in science subjects. This was in order to provide answers to the research question which stated: "*To what extent do teacher factors of; Motivation, Experience, Competence, Methods of teaching and Attitude affect performance in KCSE science subjects within Eldoret Municipality?"*

5.2 Motivation of Teachers

Two Likert scale items required teachers to state their views on the levels of motivation and the effect of financial emoluments on their delivery in the classroom. The items required respondents to answer the questions "*There is poor motivation which affects my classroom delivery"* and "*My employers' pay package demodulates me from giving my best"*. The results are presented in table 2.

Table 2: Teachers' Responses to the Item, 'Effect Of Motivation and Pay \On Performance

Response	**Motivation**		**Salary**	
	Freq	%	Freq	%
SD	6	14.3	4	10.3
D	10	23.8	2	5.1
U	3	7.1	9	23.1
A	18	42.9	16	41.0
SA	5	11.9	8	20.5
Total	**42**	**100**	**39**	**100**
Missing system	7		10	
Total	**49**		**49**	

Table 2 gives the frequency and percentages of the teachers' responses there were mixed views on the influence of motivation and salaries on their service delivery. However, 'agreed' and 'strongly agreed' if combined scored higher than the other three combined, for both motivation and salary, implying that a high number of teachers are demotivated and dissatisfied with their salaries. This is therefore be one of the factors that cause low performance. Tylor (1960) stated that the output of a highly productive person decreases when one discovers that he /she was receiving the same compensation as that of a person who produces less.

Correlation of performance in KCSE, motivation, and salaries yielded data shown in Table 3.

Table 3: Correlations of performance in KCSE sciences, motivation and salary

		Science Performance	Cause Motivation	Cause Salary
KCSEMEAN	Pearson Correlation Sig. (2-tailed)	1		
Cause Motivation	Pearson Correlation Sig. (2-tailed)	0.487(**) 0.001	1	
Cause Salary	Pearson Correlation Sig. (2-tailed)	0.223 0.173	0.168 0.306	1

**Correlation is significant at the 0.01 level (2-tailed).

There was a significant correlation (r=0.487, p<0.01) between performance in sciences and motivation indicating that as the motivation increased there was an improvement in KCSE performance in the sciences. This concurs with the findings of Ngala (1997), that the productivity of staff is influenced by the assessment of their economic worth as well as the extent to which their basic needs are met. On the other hand, there was no significant correlation (r=.223, p=0.01) between performance in sciences and financial emoluments. This can be attributed to the fact that the salary scales are the same for all the teachers in the low and the high performing schools.

The study sought to find out if there were differences between the low and high performing schools on motivation and salary and the data is shown in Table 4.

Table 4: Group Statistics on the Means of Motivation and Salary

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
There is poor motivation which affects my classroom delivery	Low	25	3.64	1.221	.244
	High	17	2.41	1.121	.272
My employers' pay demotivates me from giving my best	Low	23	3.52	1.123	.234
	High	16	3.63	1.310	.328

Table 4 shows that the mean for low performing schools with regard to motivation (3.64,SD=1.221) was higher than that for high performing schools (2.41,SD=1.121), meaning that teachers in high performing schools felt more motivated than those in low performing schools. This could therefore explain the difference in performance. On the other hand, the mean for low performing schools (3.52, SD=1.123) was not different from that of high performing schools (3.63, SD=1.310) for pay package. This could be due to the fact that many teachers in both the low and high performing schools are TSC employees hence are on the same salary scales. Independent-samples t-tests were

calculated comparing the mean score on motivation and salaries of schools identified as high performing schools and schools identified as low performing schools. The results are presented in table 5

Table 5: Independent Samples Test of Motivation and Salary

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cause Motivation	**Equal variances assumed**	.001	.971	-3.306	40	.002	-1.228	.372	-1.979	-.477
Cause Salary	**Equal variances assumed**	.512	.479	.264	37	.793	.103	.391	-.690	.896

No significant difference was found ($t_{(37)} = .264$, $p>0.05$) in the means of effect of salaries between the high performing schools and the low performing schools. The mean for the low performing schools (M=3.52., SD=1.123) was not significantly different from the mean of the high performing schools (M=3.363, SD=1.310). A significant difference was found ($t_{(40)} =-3.306$, $p<0.01$) in the means of effect of motivation between the high performing schools and the low performing schools. The mean for the low performing schools (M=3.64, SD=1.221) was significantly different from the mean of the high performing schools (M=2.41, SD=1.121). This implies that there are differences in the motivational levels between the high performing schools and the low performing schools. This concurs with the sentiments of Orora (1997), that, signs of high motivation include high performance, consistent achievement of results, energy, enthusiasm and determination to succeed.

5.3 Teacher's Competence

Teacher competence was first examined from a perspective of the teacher qualification. There was no significant correlation($r=-1.43$, $p>0.05$) between performance in KCSE science and the highest education level attained by the teacher. Teacher competence was thus defined from a summated score of a scale in the students' questionnaire. First

the scale was tested for internal consistency using Cronbach's alpha. The results indicated that the scale was reliable as it had a Cronbach's alpha value of .860 with 14 items on the scale and could be used for analysis. Frequency of the individual items in the teacher competence scale for all the schools is indicated in table 6.

Table 6: Frequency Table for Teacher Competence

Response		SD	D	N	A	SA	Total	Mean	SD
Show respect for all students	Frequency	22	24	17	86	119	268	3.96	1.268
	Valid Percent	8.2	9.0	6.3	32.1	44.4	100.0		
Are open and receptive to ideas	Frequency	9	18	21	119	98	265	4.05	1.014
	Valid Percent	3.4	6.8	7.9	44.9	37.0	100.0		
Show sensitivity to individual differences	Frequency	23	28	38	86	81	256	3.68	1.271
	Valid Percent	9.0	10.9	14.8	33.6	31.6	100.0		
Are punctual for classes in sciences	Frequency	14	28	27	78	117	264	3.97	1.205
	Valid Percent	5.3	10.6	10.2	29.5	44.3	100.0		
Show expertise in the subject matter	Frequency	12	21	8	109	83	263	3.87	1.086
	Valid Percent	4.6	8.0	14.4	41.4	31.6	100.0		
Are current with developments in field	Frequency	16	25	61	89	55	246	3.58	1.136
	Valid Percent	6.5	10.2	24.8	36.2	22.4	100.0		
Integrate theory with real-world	Frequency	14	17	37	86	50	204	3.69	1.135
	Valid Percent	6.9	8.3	18.1	42.2	24.5	100.0		
Communicate clearly	Frequency	6	12	11	129	108	266	4.21	.889
	Valid Percent	2.3	4.5	4.1	48.5	40.6	100.0		
Communicate constructively	Frequency	7	10	37	118	91	263	4.05	.938
	Valid Percent	2.7	3.8	14.1	44.9	34.6	100.0		

Communicate candidly and constructively	Frequency	6	31	30	93	96	256	3.95	1.090
	Valid Percent	2.3	12.1	11.7	36.3	37.5	100.0		
Have advanced my knowledge of the subject	Frequency	3	11	26	104	118	262	4.23	.877
	Valid Percent	1.1	4.2	9.9	39.7	45.0	100.0		
Show enthusiasm toward the subject	Frequency	3	15	34	116	91	259	4.07	.904
	Valid Percent	1.2	5.8	13.1	44.8	35.1	100.0		
Use helpful examples and references	Frequency	12	7	10	100	132	261	4.28	996
	Valid Percent	4.6	2.7	3.8	38.3	50.6	100.0		
Encourage student interaction	Frequency	14	12	13	94	128	261	4.19	1.085
	Valid Percent	5.4	4.6	5.0	36.0	49.0	100.0		

Table 6 shows that the column for (A) and (SA) when combined had higher values compared to the columns for (D) and SD). Therefore majority of the students considered their teachers competent, according to this scale. The mean scores for the high and low performing schools were then obtained and are as shown in table 7

Table 7: Mean Scores for Low and High Performing Schools for Items in the Teacher Competence Scale

	High or Low	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Show respect for all students	Low	127	4.05	1.227	.109
	High	141	3.87	1.303	.110
Are open and receptive to ideas	Low	124	4.06	1.010	.091
	High	141	4.04	1.020	.086
Show sensitivity to individual differences	Low	119	3.82	1.219	.112
	High	137	3..55	1.306	.112
Are punctual for classes in sciences	Low	122	4.06	1.123	102
	High	142	3.89	1.270	.107
Show expertise in the subject matter	Low	121	3.92	1.013	.092
	High	142	3.84	1.146	.096
Are current with developments in field	Low	116	3.41	1.187	.110
	High	130	3.73	1.070	.094
Integrate theory with real-world	Low	90	3.70	1.203	.127
	High	114	3.68	1.083	.101
Communicate clearly	Low	125	4.17	.973	.087
	High	141	4.24	.810	.068

Communicate constructively	Low	123	4.23	.787	.071
	High	140	3.89	1.030	.087
Communicate candidly and constructively	Low	119	4.03	1.065	.098
	High	137	3.87	1.110	.095
Have advanced my knowledge of the	Low	123	4.23	.876	.079
	High	139	4.24	.881	.075
Show enthusiasm toward the subject	Low	122	4.11	.855	.077
	High	137	4.03	.947	.081
Use helpful examples and references	Low	123	4.24	1.089	.098
	High	138	4.30	.909	.077
Encourage student interaction	Low	123	4.23	1.172	.106
	High	138	4.15	1.003	.085

Table 7 shows that the means for low performing schools were slightly higher than those for high performing schools for all the items except for the items: 'are current with developments in the field', 'communicate clearly', and 'use helpful examples and references' Students perceived the teachers in low performing schools (M=3.41, SD=1.187) to be less current than teachers in the high performing schools (M=3.73, SD=1.070). This could be due to lack of exposure to technological developments such as internet and current reference books.

Similar differences were found relating to the item of communicating clearly where the mean for the low performing schools (M=4.17, SD=0.973) was lower than for the high performing schools (M=4.24, SD=0 .810). The difference can be explained in terms of entry behaviour of the learners. , Learners in low performing schools are generally admitted with low cut-off points than those in high performing schools. Thus the former are more likely to have communication problems than the latter. The mean for 'use helpful examples and references' was higher in the high performing schools(4.30,SD=0.909) than for the low performing schools(4.24,SD=1.089).This could be due to availability more resources in the higher performing schools than in the low performing schools, hence the difference in performance.

An independent sample t-test was carried out to compare the means of performance in KCSE sciences based on students responses on teacher competence and the results are presented in Table 8.

Table 8: Independent Samples T -Test for Teacher Competence

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.002	.963	.831	268	.407	.06696	.08057	-.09167	.22559
Equal variances not assumed			.832	265.206	.406	.06696	.08049	-.09153	.22545

Analysis of independent sample t-tests revealed that there were no significant differences ($t_{(268)}$ =.831, p>0.05) in mean of the scale for the low performing schools (M=4.02, SD=.655) and the high performing schools (M=3.949, SD=.666).This implies that there were no major differences in the competence of teachers in the two categories of schools, basing on this students' response scale.

6. Methods of Teaching

Teachers were asked to state frequency of use of the various teaching methods. The data for the low and high performing schools is presented in table 9.

Table 9: Group Statistics on Means of Methods of Teaching Used

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
Lecture	Low	27	2.96	1.629	.313
	High	18	3.39	1.461	.344
Discussion	Low	27	4.11	1.121	.216
	High	18	3.28	1.274	.300
Questioning	Low	28	4.79	.787	.149
	High	16	4.25	1.342	.335
Labwork	Low	28	3.54	.793	.150
	High	18	3.61	1.092	257
Project	Low	27	2.52	1.014	.195
	High	18	2.56	.922	.217

Table 9 shows that the mean for low performance schools was lower (M=2.96, SD 1.629) than for the high performing schools (M=3.39 ,SD =1.461),implying that teachers in high

performing schools use the lecture method more than those in low performing schools. Discussion was used more (M=4.11, M=1.121) in the low performing schools than in the high performing schools (M=3.28 SD =1.274),probably as a way of enhancing understanding and retention of what is learnt. The same explanation can be advanced for questioning, which was higher in low performing schools (M=4.79, SD =.787) compared to high performing schools (M=4.25, SD =1.342). Lab work was lower in the low performing schools (M=3.53 SD =.793) than in the high performing schools (3.61, SD =1.092), perhaps due to inadequate resources in the former. Project work was also higher in the high performing schools (M= 2.56, SD=.922) than in the lower performing schools (M = 2.52, SD 1.014), probably due to the learners' greater inner drive and ability to work without supervision in the high performing schools. An independent Samples t-test produced data as presented in table10.

Table 10: Independent Samples T-Test of Methods of Teaching

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**Df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	Upper
Lecture	Equal variances assumed	.794	.378	-.895	43	.376	-.426	.476	1.386	.534
Discussion	Equal variances assumed	2.803	.101	2.313	43	.026	833	.360	.107	1.560
Questioning	Equal variances not assumed	11.89	.001	1.460	21.02	.159	.536	.367	-.227	1.299
Laboratory	Equal variances assumed	1.027	316	-.271	44	.787	-.075	278	-.636	485
Project	Equal variances assumed	.342	.562	-.124	43	.902	-.037	.298	-.638	.564

The data suggests that there were significant differences in the use of discussion as a method of teaching ($t_{(43)} = -2.313$, $p<0.05$) between the low performing schools and the high performing schools. There were no other differences noted from the teachers' data. The teachers responses suggested that there was more discussion in the low performing schools (M=4.11, SD=1.121) than in the high performing schools (M=3.28, SD=1.274). Based on the fact that the high performing schools were more endowed with facilities it was expected that there should be significant differences in the use of laboratory work as a teaching method. However the difference found was very small (M=3.54, SD=.793 and M=3.61, SD=1.O92) for low and high performing schools respectively. This implies that either the high performing schools do not fully utilise their resources or, the low performing schools, though not endowed, improvise and carry out many practical. On the issue of discussion as a method of teaching, bivariate correlations showed the existence of a strong correlation($r=-.319$, $p<0.05$) between KCSE performance in the sciences and discussion method of teaching. This agrees with the findings of Conboy and Fonseca (2006), that the most important factor influencing performance is the teacher, and by extension, the teaching method. The other methods had insignificant correlations.

7. Attitude of Teacher to Science

The teachers' attitude to science subjects was investigated using a semantic differential scale examination of the frequency distribution produced data as shown in Table11.

Table 11: Frequency distribution for attitude scale for teachers: Scale 1 extremely good attitude and 5 extremely bad attitudes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	10	20.4	34.5	34.5
	2.00	14	28.6	48.3	82.8
	3.00	1	2.0	3.4	86.2
	4.00	2	4.1	6.9	93.1
	5.00	2	4.1	6.9	100.0
Total		29	59.2	100.0	
Missing System		20	40.8		
Total		49	100.0		

Table 11 shows that most of the teachers 24 (82.8%) had a positive attitude towards science. A correlation was done between the teachers' attitude and the results are as shown in Table 12.

Table 12: Correlation of KCSE mean and Teacher's Attitude to Science

		KCSE MEAN	Attitude scale for teachers
KCSE MEAN	Pearson Correlation Sig	1	-054
	(2-tailed)		.782
	N	49	29
Attitude scale for	Pearson Correlation Sig	-054	1
teachers	(2-tailed)	.782	
	N	29	29

Table 12 shows that there was no significant correlation (r=-0.054, p=.782) between teachers' attitude towards science and performance of the school in KCSE sciences. This contradicts the findings of, Fonceca and Conboy (1999) who said that a teachers' positive attitude encourages and improves performance.

8. Conclusion and Recommendations

The study found significant differences between the high performing schools and the low performing schools with regard to motivation. In the high performing schools, teachers were rewarded for their work and this had a causal effect of increasing their level of motivation. Issues to do with financial remuneration through salaries got mixed reaction. Some teachers observed that an increase in salary would increase performance. This however could easily be disputed as the TSC had made such provisions where the science teachers' were given an increase in salaries but this has not resulted in an improvement in performance of sciences countrywide. The most important factor, and one of the most difficult to influence directly, is the competence of the teacher. Students readily recognize if their teachers are effective or ineffective and are quick to state the same to an outsider. This was corroborated with data from the qualitative instrument where some student stated that they did not like it when their teachers shortened lessons or simply avoided answering the hard questions from the students. The school head teachers may not be privy to the same level of knowledge of the competence of their teaching staff. Any effort to get such information is misconstrued to be infringing on the teachers rights and freedom. This brings into focus issues on the professional development of a teacher.

The study established that learners were very sensitive to the teachers' pedagogical and content mastery. There were significant differences in what students perceived as their teachers being current ($t_{(244)} = -2.263$, $p<0.05$) and communicating constructively ($t_{(261)} = -2.931$, $p<0.01$). This implied that students perceived the teachers in low performing schools (M=3.41, SD=1.187) to be less current than teachers in the high performing schools (M=3.73, SD=1.070) The competence of teachers ranked very highly among the things that students liked about science.. The methods of teaching

were found to affect performance as the learners who reported that their performance was good also attributed this to the fact that they do many practicals, carry out discussions regularly and participate in asking and answering questions. On the other hand, those whose performance was low attributed it to lack of practical work , lack of discussion , the teacher dictating, not giving notes or giving notes with no explanation, and the teacher not involving learners in what he/she is teaching. Generally practicals/experiments, which should be the core of science-teaching and which majority of students enjoy were not being used adequately as a method of teaching as reported by students. There was no significant correlation (r=-0.054, p=.782) between teachers attitude towards science and performance of the school in KCSE sciences.

9. Recommendations

Science educators and school leaders need to implement measures that encourage the development of teacher expectancies for high performance of learners. This requires generous support mechanisms through which resource materials are made available. There should be more and frequent in-servicing of both head teachers and teachers on ways of enhancing the teaching/learning of science. The teaching of science subjects should be totally practical oriented. .

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