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RESEARCH ARTICLE

DIFFERENCES IN PERFORMANCE BETWEEN BOYS AND GIRLS IN SECONDARY SCHOOL SCIENCE SUBJECTS IN KEIYO DISTRICT, KENYA

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This paper analyses the differences in performance between boys and girls in science subjects and probes the possible causes of these differences in the context of attitudes borne by learners, teachers and school heads. It is based on a study that sought to find out whether or not there was a relationship between gender and attitudes towards learning of sciences in secondary schools in Keiyo District in Kenya. The study employed a descriptive research design and was based on the gender relations theory. Data was collected by use of questionnaires from 300 form three students from (30%) of secondary schools in Keiyo District. Stratified sampling was used to select among the different types of schools. Simple random sampling was used to select the individual student respondents. Science teachers from sampled schools were also selected as teacher respondents. Descriptive and inferential statistics were employed in data analysis. There was no difference in performance between boys and girls but there was a significant difference in mean scores in science by single sex schools compared to mixed schools. The study concluded and also further recommended it is important that parents teaches peers and education stakeholders in general change tact and allow both boys and girls to study science without paying attention to the mere stereotypes which make the girls shy away, and thus perform poorly, from the practical science subjects. The study is significant as it informs policy makers and education stakeholders about gender and learning of science among secondary school students in Kenya.

Introduction

Despite the many variations in the explanations they put forward, many investigators such as, Fennema and Carpenter (1981), Fennema and Sherman (1977) and Sherman (1980) have presented convincing evidence that boys outshine girls in their mathematics and science performance at high school level. Nonetheless, the picture seems to differ when one examines the case for elementary school learners. A number of studies such as Barton (1979), Fennema and Carpenter (1981), Fennema and Sherman (1978), Hilton and Berflond (1974), as referred to by Meyer and Fennema (1988), have disclosed no gender difference in mathematics achievement at different levels of the elementary as a whole.

A few studies have, however, revealed that there is difference in favour of either boys or girls. According to Marshall (as cited in Suzan, 1980), girls were better than boys in solving computational items, whereas boys were better in solving higher level cognitive problems such as application items and word problems. Somewhat differently a longitudinal study (Marshall & Smith, as cited in Fennema & Sherman, 1978) have reported significant differences in favour of girls in almost every mathematics area evaluated in the third grade, although the difference converge by the time the students reached the sixth grade.

In conclusion gender attitude towards science and mathematics matters a lot and exist. From most of the revised studies girls appear to have more unfavourable feelings towards science than boys.

Whereas this could be true the reasons behind the attitudes advanced by the quoted study might not hold true for schools in Keiyo District.

Women in Science and Technical Fields

Haryhoe (1989), in Chinese Academy of Science (CAS), points out that the percentage of women in technical professions declined from 35.59% to 30.08% in 1985 compared to previous years. Haryhoe (ibid.) asserts that the academic status of women in China is low. The only women who were members of CAS in 1984 were 26 out of 644 members, which was only 4%. Haryhoe (ibid.) also realized that of the 35 members of the standing committee of National Scientific Association, only one was a woman representing only 2.8%.

Haryhoe (1987), in a survey, further showed that the attitude of women engaged in scientific and technical work was very negative. When asked about the attitude of their unit's leadership towards female scientific and technical personnel. It looked down upon them and underestimated them. When asked what the percentage of women in leading groups in their units, 43.3% wrote there are none in leadership position.

At aquatic Research Institute, women make up to 50% of the scientific and technical personnel, but there was not a single woman in any of the leadership groups. Five percent of the women surveyed felt they had the support of their unit's leadership to engage in academic activities. A survey conducted among female science teachers at secondary and universities in 6 Sichwan cities has likewise revealed their low status. At the 6 Tertiary institutions, there was not a single woman cadre among the school level leadership. The number of professors was very low. Only 6% of department chairs in the science were women, 12.5% of research institutes heads were women and 9.5% of the directors of research were women. Majority of the Sichwan teachers felt frustrated by the restrictions preventing them from fully displaying their initiatives. They revealed that continuing influence of traditional attitude prevented the accomplishment of women intellectualism.

The problem of self-image is one that has been observed in many countries and among women of varying ages, incomes and education (Haryhoe, 1987). In Kenya the number of women scientists, administrators, lecturers, politicians and teachers are far below that of men. This is a clear demonstration that women in our society are still discriminated against. Generally an empirical study was done in order to verify the above claims affecting students' attitudes towards learning of science in Keiyo District.

Statement of the Problem

There has been an interest in the development of positive attitudes among students towards the learning of science and mathematics. The objective of any science curriculum includes fostering favourable feelings towards learning of science as well as imparting cognitive knowledge. Therefore, the author was prompted to undertake a study because of the fact that fewer girls excel in science while majority underachieve. Fewer girls than boys continue with the study of science and related courses at higher levels of education and girls are underrepresented in areas requiring certain qualification in sciences (Karanja, (2004).

While releasing the KCSE results for the years 2004, 2005, 2006, 2007 and 2008, the then minister for education pointed out that girls underperform when compared to the boys, especially in sciences and mathematics. Over the same years the District Education officers and the provincial Directors of Education complain that there has been a disparity between boys and girls in practical science subjects. Given that students differ in their academic achievements in science subjects, there was need to find out whether or not the gender attitude towards science subjects are related to their academic achievements. The study therefore sought to investigate whether there are any significant relationship between gender and performance in learning science subjects.

Limitation of the Study

The study was conducted in Keiyo District only. As such, the findings on gender and attitude towards science subjects by students may not be generalisable to other areas in Kenya. Nevertheless, the study provides a framework on which similar studies could be conducted in other areas.

MATERIALS AND METHODS

The study was carried out among students and teachers of secondary schools in Keiyo District of Rift Valley Province of Kenya. The area is highly populated with 25 secondary schools out of 35 secondary schools in the District. The people of Keiyo have a conviction that Education is a tool of empowerment, leading to self reliance. Education is the core business of schools, indeed the child is the reason that any school exists. Keiyo District has 35 secondary schools, 10 of them are on the arid lowlands of the escarpment while the rest are on the highlands. The District was convenient to researcher in times of proximity and accessibility to those schools. Poor performance in KCSE Examinations and the general low female scientist from the District in various careers compared to male is evident.

The study population was form three students, science teachers, and heads of science departments of the selected school in Keiyo District. Purposive sampling was used to select the form three classes. At Form Three students select the science subject to the examined and the Form Four students were busy preparing for the final examinations. Stratified random sampling was used to select school which participated in the study. Stratification was done according to gender composition of the schools. Simple random sampling technique was used to select 30% of schools from each category. A class from each category was selected using simple random sampling in schools with more than one stream. To select 20 students from a class, simple random sampling technique was used. Convenient sampling was used to select the science teachers for interviews. Out of the 300 students, efforts were made to ensure that the boys and girls were included in equal numbers of 150. Teachers of both sexes were also chosen.

The study adopted an exploratory approach using a descriptive research design. The researcher designed a questionnaire, which was used in the collection of data from the respondents. Two types of questionnaires were prepared. Students' questionnaire to indicate how different people feel about science filled the first questions. The items were concerned with how students, parents and the teachers are perceived by the students. The responses were scored in the Lickert scale. Teacher's questionnaires comprised items, which captured the teacher's feelings towards science teaching. The items were designed to secure teachers' opinion of their expectations.

Data was analyzed using descriptive and inferential statistics. The questions in the questionnaire were analyzed using statistical package for social science (SPSS) and computer excel program. Lickert scale was also used to place items at part that is either negative or positive. The negative responses and positive responses took positions 1 and 5 respectively. The descriptive statistics, mean frequencies, percentage, tables, graphs were used to analyze data.

RESULTS AND DISCUSSION

Gender Differences in Performance in Science Subjects in Keiyo District

The study established that there is no significant difference between male and female students' perception, expectations and attitude towards learning sciences in Keiyo District. Similarly, the teachers did not seem to have any preferences in favour of either male or female students when it comes to learning science attitude or ability.

Consequently, the belief that boys are better in sciences or are perceived to be better has not been proven statistically with respect to Keiyo District. It became important, therefore, to establish whether or not in actual sense boys perform better than girls in science subjects at KCSE level in Keiyo District or it was yet another stereotype. The study used the KCSE results for the year 2005 to carry out this analysis and the findings inform the discourse. The results in Table 1 show that there is no significant difference in performance in science subjects between boys and girls in Keiyo District.

Table 1: Independent sample t-test for Students Performance in Science in Keiyo District 2005 by Gender

Performance	Gender	N	Mean	t	df	Sign. 2 tailed	interpretation
Chemistry subject means for 2005	boys	6	4.94	.071	12	.945	Difference not significant
	girls	8	4.87				
Biology subject means for 2005	boys	6	5.45	-0.14	12	.891	Difference not significant
	girls	8	5.55				Difference not significant
Physics subject means for 2005	boys	6	5.89	-0.1	12	.923	Difference not significant
	girls	8	6.01				Difference not significant
Mathematics subject for 2005	boys	6	3.9	0.44	12	.665	Difference not significant
	girls	8	3.49				Difference not significant
Chemistry subject means for 2005	boys	6	4.94	3.35	18	.004	Difference significant
	girls	14	3.02				Difference not

							significant
Biology subject means for 2005	boys	6	5.45	2.52	18	.021	Difference significant
	girls	13	4.12				Difference not significant
Physics subject means for 2005	boys	6	5.89	1.99	17	.063	Difference not significant
	girls	13	4.24				Difference not significant
Mathematics subjects for 2005	boys	8	3.9	4.28	17	.001	Difference significant
	girls	14	1.97				Difference not significant
Chemistry subject means for 2005	boys	8	4.87	4.46	20	.000	Difference significant
	girls	13	3.02				Difference not significant
Biology subject means for 2005	boys	8	5.55	3.6	20	.002	Difference significant
	girls	14	4.12				Difference not significant
Physics subjects means for 2005	boys	8	6.01	3.73	19	.013	Difference significant
	girls	13	4.24				Difference not significant
Mathematics subjects for 2005	boys	8	3.49	3.04	19	.007	Difference significant
	girls	13	1.97				Difference not significant

This statistics confirm that the belief that boys perform better than girls is just a myth and a stereotype, at least, at least for Keiyo District. It implies that gender, perception and attitudes are not the problem. It behoves scholars to try and unravel the cause for perpetual poor performance in science among students of both gender in Keiyo District and Kenya as a whole.

Further analysis of the KCSE science subjects results for the year 2005 showed that of the 28 secondary schools in Keiyo District that presented students for KCSE, half, 14(50%), were mixed schools, 8(28.6%) were girls' only schools while 6(21.4%) were boys' only schools. In single sex schools, there was no difference between the mean scores for boys as compared to those of girls in all science subjects. Yet the difference was significant in all science subjects compared to the mean scores for boys' schools against those for mixed school. Similarly, the difference was significant between mean scores for girls' schools compared to mixed schools. This suggests that the problem is not the gender but the type of school and the resulting learning environment.

From the data obtained by interview, on the question of performance and science abilities, 10(67.7%) said that girls are not very firm and strong; they are apologetic and do not take sciences seriously. Some of them kept repeating the same point that girls tend to believe they had enough support. One of the female teachers said that girls tend to believe that science was in-born, and therefore only those who were born with the ability would make it. The correlation coefficient was found to be 0.98 and therefore the instruments were considered a reliable. Interlinear by birth were the only ones to be allowed to do science-related courses or higher levels of learning.

An attempt was made to check whether or not the problem of poor performance in science subjects was unique to Keiyo District. A one sample t-test for Chemistry and Physics using the national mean score as the test statistic shows that there is no significant difference between the means as shown in Table 2 and Table 3.

Table 2: One-sample Statistics for the Mean of Performance in Chemistry in 2005

	N	Mean	Std. Deviation	Std. Error Mean
Chemistry subjects means for 2005 in Keiyo District.	28	3.96	1.53	.2897

t- test value = 4.0479

Chemistry subject means for 2005 nationally	t	df	Sig.(2-tailed)	Mean Difference	95% Confidence Interval of the Difference
				Lower	Upper
	-0.3	27	.768	-8.62E-002	.5082

Table 3: One-Sample Statistics for the Mean of Performance in Physics in 2005

	N	Mean	Std. Deviation	Std. Error Mean
Physics subject means for 2005	27	5.13	1.88	.3614

Test Value = 5.3560

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
Physics subject means for 2005				Lower	Upper
	-0.62	26	.543	-0.22	.5203

In both cases, Chemistry and Physics, the difference between the Keiyo District's mean score and the national mean score was not significant. This implies that the problem of low performance in science subjects is not unique to Keiyo District but a national problem.

In summary, majority of secondary schools in Keiyo District were mixed schools. In single sex schools, there is no difference between the mean score for boys as compared to those of girls in all science subjects. This is contrary to expectations. There has been a stereotype that science is a male domain (Dunning & Sherman, 1997). However, there does not appear to be any empirical evidence that girls put in similar learning environment as boys perform poorer. In this study the mean scores for boys and girls learning separately in Keiyo District are shown not to be significantly different in all science subjects and mathematics. Yet the difference is significant in all science subjects when comparing the mean scores for boy's schools against those for mixed schools. Similarly, the difference is significant between mean score for girls only schools compared to mixed schools. In all instances, the single sex schools perform significantly better than mixed schools. This suggests that the problem is not the gender but the type of the school and the resulting learning environment.

CONCLUSION AND RECOMMENDATIONS

On difference between boys and girls performance in science subjects, the study has revealed that there is no difference between mean scores for girls and those for boys in all science subjects, including mathematics in Keiyo District. The difference is, however, significant for mean scores in science subjects for students in single sex schools compared to the mixed schools. Since the mixed schools are the majority in the District, it means that they contribute significantly to the poor performance in science subjects in the District and Kenya as whole. This is an indication of a serious problem based on school type, not gender, in the performance in science subjects at the KCSE level in Kenya.

Having established that there is very little problem to do with attitude, perception and expectation vis-à-vis performance in learning science in Keiyo District, it is therefore important that parents teachers, peers and education stakeholders in general adopt more effective teaching/learning tactics to allow both boys and girls to study science without paying attention to the mere stereotypes which make the girls shy away from the practical science subjects.

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