



Factors Influencing Girl's Performance in Physics in National Schools in Kiambu and Nairobi Counties of Kenya

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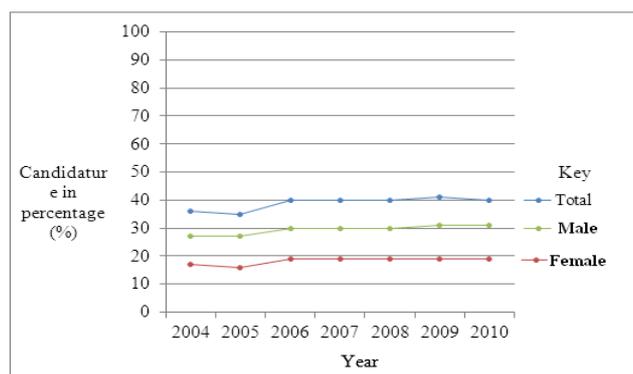
Abstract: This study was designed to investigate factors that influence girls' enrolment and performance in physics in five (28%) traditional national schools in Kenya. Meaningful learning of physics is the hallmark of a technologically competent workforce in science, technology and engineering. However, there is a lower performance index and enrolment of girls opting to study physics at Kenya Certificate of Secondary Education (KCSE). Specifically, the factors of attitudes of students, learners' ability and teacher characteristics were found to affect enrolment and performance of girls in physics. Three theories that influence the understanding of the issues in this study include Bloom's Theory of Affect, Bruner's Theory of Constructivism and Kneller's Progressive Theory. Despite intervention measures by the Ministry of Education to alleviate girls' polarization in enrolment and performance in physics, the Ministry of Education Science and Technology (MOEST), 2006 module report upholds that there are negative influences in the teaching and learning of science. A wide range of literature review on girls' enrolment and performance in physics nationally and in sub county schools showed low enrolment and poor performance at KCSE. However, no research was evident on factors that influence girls' performance in physics in Kenya national schools. The study used a survey design among five national schools in Nairobi and Kiambu counties; form two class was chosen as the target population as well as teachers of science and mathematics in the five schools. Purposive and simple random sampling was used in the study. A random sample of two hundred and twenty eight form two students was selected from the five schools. From each school a sample of forty five students was selected using a simple random sampling method. Questionnaires were used to collect data for both teacher and student factors. In addition, an Achievement Test was used to isolate areas of misconceptions that account for poor performance of girls compared to boys. The data was analysed using both descriptive and inferential statistics. Statistical Package for Social Sciences (SPSS) was used in data analysis. Means, frequency distributions and percentages, histograms, and pie charts were determined. Likert Scale was used to measure attitudes affecting performance of physics among all the targeted girls' schools and the teachers. The study showed students' attitude, learner's ability and teacher characteristics, affected girls' enrolment and performance in physics in national schools. The girls had better positive attitudes and performance in learner abilities in physics than the boys. The results also showed that teachers of physics in girls' national schools are effective and efficient in instructional designs. The findings of this study may be used to foster positive attitudes towards physics. The methods of physics instruction among girls may also be impacted by constructivism approaches as the results show strong preference to physics practical work.

Keywords: Secondary Education, Girl Child Performance, Physics, Science Education

1. Introduction

Physics education is an important part of the foundation for many occupations (VanGorden and Slater, 1998) and consequently, the issue of enrolment and performance of girls in physics has been a subject of discussion and research globally (Farmer, 1993). The United Kingdom (UK), Dainton report of 1968 established that the number of boys studying

physical science subjects beyond compulsory period far outweighed the number of girls. Likewise Kenya National Examinations Council (KNEC) reports of 2004 to 2010 attest this similarity as shown in Figure 1.1.



Source: KNEC, 2004 – 2010 Reports.

Figure 1.1. National KCSE candidature in physics (2004-2010).

Figure 1.1 shows KNEC physics enrolment of female and male candidates in national examinations during 2004 - 2010. The trend of females being outnumbered by males is evident, almost in the ratio 1:2. This is in spite of an overall trend of KCSE physics enrollment being below forty one percent (41%) nationally.

The current high school curriculum in Kenya puts emphasis on science subjects and yet students' performance in the science subjects in national examinations has been consistently poor over the years (Madera, 2001). Despite equal education opportunities, there is growing evidence since 1990's that boys have continued to perform better than girls in physics (Elimu, 2007). However, there is no evidence to suggest that girls and boys have any significant inherent differences in ability (Bennett, 2003). A review of literature by Zhu (2007) shows that Self-Efficacy (SE) is a successful predictor of students' course-taking although many other factors which are contextual variables have been reported to have influence on Physics Self-Efficacy (PSE).

2. Literature Review

It is increasingly important that the nature and ways of science be understood and how actions of society affect living things (Enger and Ross 2000). Studies done by O'Brien (2002), show that boys are more likely to take all the three core science courses (biology, chemistry, and physics) and enroll in advanced placement physics approximately three times as often as do the girls.

An earlier study by Duckworth and Ormerod, (1975) found physics to be preferred and more widely chosen by boys than girls. However, students' enrolment in physics is inhibited by conflicts with other courses, extracurricular activities and fear of failure (Crawley and Black, 1992). This trend of low enrolment in physics is also observed in Kenya following KNEC 2006 and 2007 Reports.

Science is perceived as masculine from the way it is presented (Bennett, 2003).

Kelly (1985) identified four senses in which science could be considered to be masculine. First, the majority of those who choose to study it are male, so that it is seen as a predominantly male area of academic activity. Second, it is

mode of instruction suits more the interest and motivation of boys. Third, behaviours in science classes are such that boys and girls act out characteristic gender roles. Finally Kelly (1985) suggested that because it has been socially constructed in a parochial male-dominated society, science is itself inherently masculine. However, this suggestions do not rule that female are incompetent in studying science for milestone scientific works have been achieved by females like Madame Mary Curie and Florence Bacon (Tillery, 2007) in the history of science.

The experimental nature of science fosters teamwork and manipulative skills of objects as well as promoting observational, deductive and evaluative skills (Wan and Van, 2006). Science derives its power and authority from its empirical method; a method that comprises a sure and reliable inference from observation and experiment. This authority is from the senses and experiences from which scientific knowledge is constructed (Stanesby, 1985). It is the nature of science therefore to look for more new knowledge, through two processes referred to as deductive and inductive reasoning (MOEST Science Module, 2001). These skills sit well within the KCSE physics course and are essential in the learning and teaching of physics, especially in field trips, practical and project work, (KIE Secondary Syllabus, 2002). Teaching to understand science follows Bacon's view of understanding nature from consulting nature and not the writings of Aristotle (Stanesby, 1985).

Scientific methods and values include seeking to answer questions using some kind of evidence, recognizing the importance of rechecking data, and understanding that scientific knowledge and theories change over time as more information is gathered (Rezba, 1999). Science contributes its unique skills, with its emphasis on hypothesizing, manipulating the physical world and reasoning from data (Padilla, 1990).

Scientific investigation in Figure 2.1 includes proposing an explanation for the observation made, use of explanations to make predictions, testing of predictions by doing an experiment by making multiple observations, modification of explanation if need be, and drawing conclusion(s).

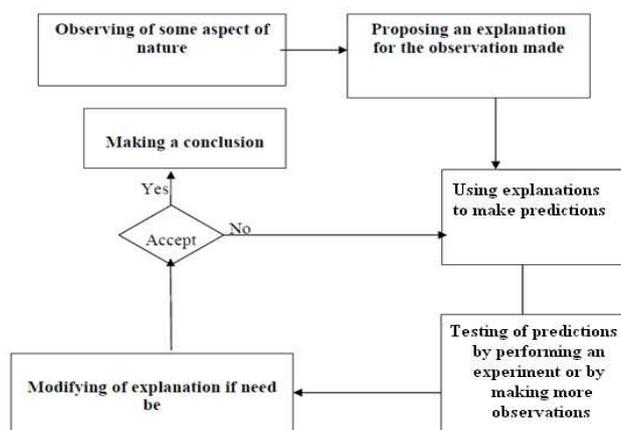


Figure 2.1. Steps in scientific investigation Source: Developed by Akweya, J. S. (2012).

3. Methodology

3.1. Research Design

The Research was designed and developed as illustrated below.

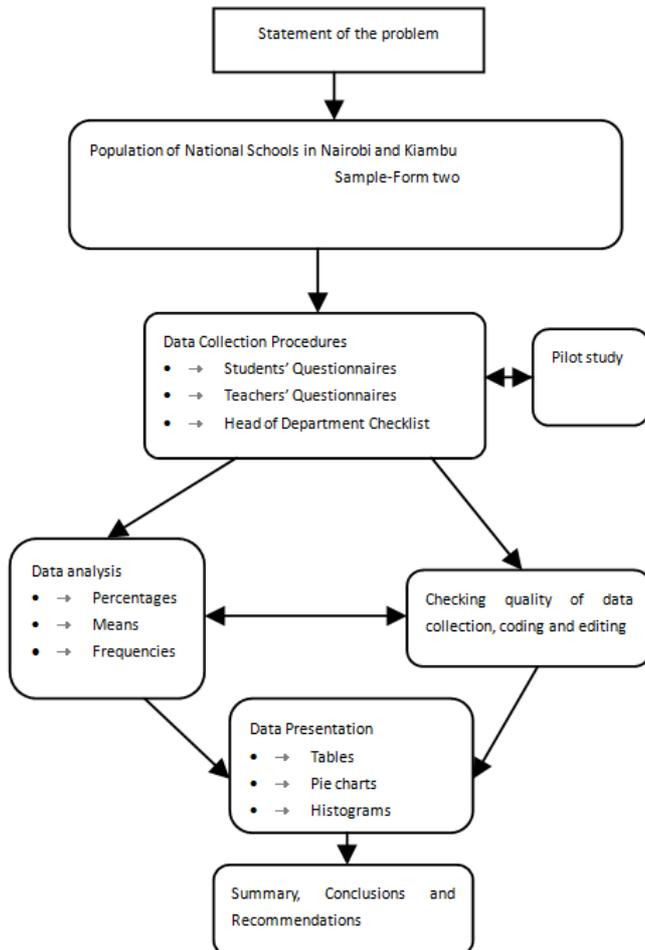


Figure 3.1. Research Design.

Four instruments (Physics Student Questionnaire (PSQ), Teacher Questionnaire (TQ), Head of Department Checklist (HDC) and Learner Achievement Test (LAT) were used during the study.

3.3. Results and Interpretation

The government of Kenya has formulated policies to industrialize the country by 2030. However, low enrolment and performance index of girls opting to study physics can be a setback. This deficit can have serious implications for the career options available to women given that an average of just 8 per cent girls enroll in the physics course in high schools in Kenya (KNEC Report, 2007). Thus, the persistence of less girls opting to study physics is worrying and calls for further investigation, especially when it comes to the cream of the girls in the national schools. This study was set to investigate factors affecting girls' enrolment and performance of physics in Kenyan National Schools. The main objective of the study

was to investigate the factors that influence girls' enrolment and performance in physics in national schools in Kenya. The study was set to find out:

- the attitudes of girls as compared to the attitudes of boys towards the learning of physics,
- the effect of learner abilities of girls' performance in physics,
- teachers' characteristics that influence girls' enrolment
- characteristics that influence girls' performance in physics.

The following were the main findings of the study:

a) The attitude of girls towards studying physics in national schools in Kenya is better (4.06) and was slightly higher than that of the boys (4.00). This is the main reason why girls opt to enroll to study physics at KCSE. The attitude is influenced by the life around the girls, career related factors such as studying engineering and technological courses at tertiary levels.

b) Girls in national schools are good in physics when it comes to developing and applying key abilities like mathematical, spatial and concept development.

c) Instructional modes that benefitted girls most in national schools were remedial teaching, present in seventy per cent (70%) measure, which is used to clarify some difficult concepts, and team teaching in fifty per cent (50%) measure.

d) The attitude scale shows that teachers of physics in the national girls' schools are positive when it comes to commitment of instruction of physics. Teachers go a long way to ensure that girls like and understand the study of physics.

e) The workload of physics teachers in national girls' schools is modest. This allows teachers to invest more time to guide girls in physics content.

4. Conclusion

The investigation in this study established the relationship between instruction of physics among girls versus their enrolment and performance in reference to Kneller's progressive theory, Brunner's constructivism theory and Bloom's instructional theory. Upholding Kneller's progressive theory girls are influenced to enroll for physics so long as Brunner's constructive theory and Bloom's instructional theory are used during physics instruction. Applying Brunner's constructive theory and Bloom's instructional theory in physics instruction guarantees good performance in physics.

The results show that enrolment and performance of girls in physics in national schools in Kenya are influenced by attitude, learner abilities and teacher characteristics. The research showed a positive attitude towards physics among girls in national schools. However, low enrolment in physics at KCSE is affected by the less negative attitude and low performance of girls. Girls can be 'delicate' and a 'small' attribute can lift or derail a girl from studying physics. That is why teachers of physics have to go an extra mile in preparation, instruction and assessment, in school physics.

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