Key words: *Structural Changes, TVET engineering Curriculum, Technician Engineering Training*

E2012-40: Roles of Community Based Organizations (CBO's) Catering for the Social Welfare Needs of Orphans Positively Living with HIV/AIDS. A Case of Faith of Hope Centre in Kakamega.

Leting Mark & Chebunet Philip, mleting@yahoo.com,

Abstract

Studies' explaining the role of community based organizations in catering the needs of HIV positive orphans has not been adequately addressed. The research sought to study the role of community based organization in catering for the social welfare needs of HIV positive orphans. The research utilized survey design. The objectives of the research were to establish the role of the CBO's in catering for the social welfare needs of HIV/AIDS orphans, investigate the type of social welfare needs of HIV/AIDS orphans, investigate the type of social welfare needs catered for by the community based organization and investigate the challenges faced by the CBOs in provision of services. Based on the objectives, the study found out that CBOs play a great role in catering for the social welfare needs of HIV positive orphans and the entire community. CBOs use activities such as workshops, medical camps, awareness and campaigns and HIV testing and counseling to provide for the needs. Challenges in service delivery are faced by the CBOs due to financial and resource accessibility. The study recommends that CBOs should be given adequate support by the government and communities in order to encourage them to participate fully for the well being of the orphans positively living with HIV/Aids.

Key words**:** *Orphans, Community based organizations & social welfare needs*.

E2012-41: Biology Education: A Teachers Perspective on the Challenges in the Delivery of Content and Performance in Biology. A Case of Bungoma County, Kenya

Nyongesa W. Kennedy
Kabarak University**,** kennyongesa@yahoo.com

Abstract

Biology is a teaching and learning subject at secondary school level in Kenyan schools. Higher education does not exist in isolation but is a build up from knowledge gained at lower levels of education. Biology plays a key role in industrialization and other sectors of the economy. Biology is practical subject, which equips students with concepts and skills that are useful in solving the day-to day problems of life. The study of biology aims at providing the learner with the necessary knowledge with which to control or change the environment for the benefit of an individual, family or community. However, the secondary school students' performance in biology as a learning subject in the Kenya Certificate of Secondary Education (KCSE) in Bungoma District has been quite low over the years. The public outcry and concern by parents, teachers, educationists and students about poor performance in science subjects and mathematics in national examinations is a clear indication that factors influencing student's performance in these subjects need urgent investigation. The aim of this study is to investigate the influence of teacher related factors on performance of secondary school students in biology. The Cross-sectional descriptive research design was employed in this study. Nine (9) secondary schools were randomly selected for study

out of 139 schools in Bungoma district. Different categories of schools were used depending on the school set-up and these are (i) Single- gender boys boarding schools (ii) Single- gender girls boarding schools (iii) Single- gender girls day schools (iv) Co-educational boarding schools (v) Co-educational day schools (vi) Co-educational boarding / day schools. Co-educational schools were considered to reduce possible biases. A total of three hundred and sixty (360) form three students were randomly selected for the study. A student questionnaire (SQ) and a teacher questionnaire (TQ) were used as the main instruments for data collection. Class mark lists were used as tracking records of performance in biology. Data collected were analyzed using descriptive statistics. The study established that boys perform better than girls in biology. Female teachers were found to have a higher level of science anxiety in the teaching of biology compared to the male teachers. It was established that most teachers still used the traditional lecture method in the teaching of biology and only a smaller percentage were using the SMASSE(ASEI/PDSI) approach. This study was expected to significantly contribute in the provision of information that could be used by teachers, parents, educationists and policy makers to improve on the teaching, learning and performance of students in biology.

Introduction

According to Hawes (1979), the late 1960's saw the planning and development of new science syllabuses in the United States of America and Britain after the launching of the Sputnik by Russians in 1957. In the early 1960's an American science curriculum project, the Biological Sciences Study Committee (BSSC) was formed. The preparation of the biology curriculum was based on the British Nuffield science courses. These curriculum developments spilled over into developing countries in Africa in the early 1970's. The introduction of highly sophisticated and expensive scientific and technological education for the developing African states was done without regard to laying foundations in secondary schools for fundamental growth of knowledge, skills and attitudes necessary for understanding them. The importation of science curriculum packages into Africa had far reaching repercussions on the development and implementation of the biology curriculum and that of other science subjects like physics, chemistry and mathematics at secondary school level in Kenya from that time to-date.

In East Africa, the Secondary Science Project (SSP) was supported by an organization in Britain called the Curriculum Research and Development Overseas (CREDO). The SSP biology course has since been amalgamated with the traditional biology course to form the new biology course for all secondary schools. The birth of Science Education Programme for Africa (SEPA) in 1969 saw the establishment of science curriculum development centre at the Kenya Institute of Education (K.I.E).

Since 1963 at independence, the education system in Kenya has undergone fundamental changes. The main reason why the Government of Kenya decided that science and technological subjects be taught in school was the recognition of the important role, science and technology education play in the economic, social and industrial development (Republic of Kenya, 1972). The Government of Kenya also spends over 30% of the annual budget on education (Republic of Kenya, 1989). Eshiwani (1993) observed that a large proportion of this money is channeled towards the improvement of science education. However there is no evidence that this increased expenditure has necessarily been associated with improved performance in science subjects on the part of the learners at the secondary school level (SMASSE Project, 2000).

In Kenya many science teachers are at present experiencing considerable disquiet as a result of the demands made on them, and the various strategies advocated. In recent years a spirit of change and innovation has pervaded science education activities in this country. Science education has been in a lot of lime light, for example the project called Strengthening of Mathematics and Sciences in Secondary Education (SMASSE), which was initiated by the Ministry of Education to provide in-service refresher training for science and mathematics teachers. In the SMASSE in-service training, teachers are given information that is integrated with hands-on activities and inquiry that assists teachers to have more interest and less anxiety when teaching.

The Government of Kenya has particularly felt a need to improve the science education it offers so as to build up a knowledgeable manpower required for its industrial and technological transformation (Republic of Kenya, 1999; SMASSE Project, 2000). In this regard, existing practices must be reviewed from time to time in the light of new development and changing requirements. In Kenya today, the most dominant feature of the education system is academic performance (Chepchieng, 1995). As such explanations for good and poor student academic performance have been exhaustive, yet controversy still exists among scholars as to what contributes singly or jointly towards students' poor performance (Chepchieng, 1995). Eshiwani (1984) also gives us an insight into the reasons why learners perform poorly in science subjects; he suggests the following reasons: inadequate time allocated for learning science satisfactorily, inadequate instruction material, low level and inadequate training of teachers, the nature of the science curriculum-it is highly abstract and seems irrelevant to the learners' immediate environment. This leads to the learner's negative attitude towards science.

In Bungoma district the essential elements have been an emphasis on science and technical subjects. Different methods of teaching are being used by biology teachers, with the hope to optimize learning on the part of the learners. An improved instructional technology is making inroads in the school system and institutions are of a new kind, intended to make learners achieve higher (SMASSE Project, 2000). A study of this kind also draws importance from the fact that achieving the aims of industrialization can be jeopardized if a large proportion of anticipated beneficiaries do not have adequate access to appropriate kinds of education and training in science.

Biology has no limits and involves every aspect of a person's life. Biology is a branch of natural science that involves the study of living things. The word biology comes from the Greek words *bios* which mean life and *logos* which mean knowledge. Therefore, biology means the knowledge of life (Kenya Institute of Education, 2005). Biology has a lot of relevancy in every day's life because it helps man to understand himself and the environment around him. Biology naturally leads to career and employment opportunities. It is continuously opening up various professions to men and women in medicine, agriculture, conservation, research, home science and industry. According to the Kenya Institute of Education (2005), the importance of biology to humanity can be outlined as follows:

(i) The learning of biology helps us to know how to use natural resources more efficiently in industry e.g. in bio-technology, food production, building and textile and paper industries.

(ii) The learning of biology helps us to understand changes in the environment and the factors affecting these changes, in order to know how human needs are influenced.

(iii) The learning of biology is important in helping mankind to find effective ways of preventing, treating and curing diseases and home management techniques e.g. better methods of food preservation, efficient food preparation and care of the family

(iv) The learning of biology is important in helping the improvement of agricultural yields through scientific research.

Statement of the Problem

The performance of students in biology in the Kenya Certificate of Secondary Education (KCSE) has been unsatisfactory over the years in many secondary schools in the country (KNEC, 2000). In Bungoma District, the performance has been lower than expected in this subject as indicated by

records from the District Education Office. This has caused a lot of public outcry and concern about the performance in science subjects and mathematics (KNEC, 2000). Studies focusing on the impact of different factors on performance in biology at secondary school level are not well conceptualized. This lack of sufficient knowledge regarding these factors and their influence would militate against the country's aspiration to achieve the 'Vision 2030' and the Millennium Development Goals (MDGs). This is because biology is one of the key science subjects that contribute towards industrialization, environmental conservation, medical research, food management and improved agricultural production. It is therefore important to study the influence of these factors on performance in biology.

Purpose and Objectives of the Study

The purpose of this study was to determine the influence of teacher related factors on performance in biology as a learning subject at the secondary school level in Bungoma District.

The specific objectives of this study were to:

(i) To investigate the influence of the teachers' gender on performance in biology.

(ii) To investigate the influence of teachers' science anxiety on performance in biology.

(iii) To investigate the influence of the teachers' academic level of professional training on performance in biology.

(iv) To investigate the influence of the teachers' teaching experience on performance in biology.

(v) To investigate the influence of the teachers-pupil classroom interactions on performance in biology.

Research Questions

The study addressed the following research questions:

(i) What is the influence of teachers' gender on performance in biology?

(ii) What is the influence of teachers' science anxiety on performance in biology?

(iii) What is the influence of the teachers' level of professional training on performance in biology?

(iv) What is the influence of the teachers' teaching experience on performance in biology?

(v) What is the influence of the teacher-pupil classroom interactions on performance in biology?

Significance of the Study

The findings of this study will have both theoretical and practical benefits to the future of science education in Kenya. The study is expected to contribute to the advancement of knowledge about science education and biology education in particular. The study may lead to improved strategies in teaching and learning of biology not only in Kenya but also in other parts of the world. The study may also be of immediate benefit to the Ministry of Education (MOE) and the National Council on Science and Technology (NCST) in the formulation of future science education policies aimed at enhancing students achievement in science subjects related to biology, which are chemistry, physics and agriculture. This study will assist teachers in helping students to develop positive attitudes towards the learning of biology. It will also assist parents to understand their role in helping their children towards the learning of biology.

Scope of the Study

Teacher factors that could influence performance of students in biology were focused. The teacher factors the study addressed were: gender, science anxiety, professional training, and teaching experience, teaching methodologies, teacher expectations and teacher-pupil interactions in the classroom. The study also attempted to investigate the genesis of the positive and negative attitude towards the teaching of biology and the genesis of science anxiety in the teaching of biology. The population for the study consisted of biology teachers and biology students at the form three level in Bungoma District in the Western Province of the Republic of Kenya

Background to the study

Banu (1985), examined attitudes towards sciences held by secondary school students in Gongola State, in Nigeria. He concluded that the quality of science teachers and development of more relevant curriculum might improve students' attitude toward science subjects. Shumba (1993) surveyed the attitudes of students of form two and form four towards science subjects in Zimbabwe. It was noted that there was a significant difference between attitudes of the students at different levels. In this study, he cited the teachers' influence as a possible reason with the impoverished attitudes of students. It was also indicated that the secondary school science teachers in the Harare Region where the study was carried out reported lack of facilities and resource materials to support hands-on activities. He recommended that the pre-service teacher education should not rely on the convenient lecture method, as this could not inculcate positive attitude towards sciences by the prospective teacher. He observed that teachers may lack enthusiasm of making science subjects

enjoyable to students due to lack of practical instrumentation and experimental techniques especially in cases of physics, chemistry and biology. These skills are relevant in industrial practice and production.

A student learning biology will understand the value of concepts learnt or taught when he can see their utility in practical life (Shumba, 1993). Attitudes are very important for effective learning (SMASSE Project, 2000). Galloway (1985) typically, found that teachers held stereotyped ideas about parents and children from different social groups. These leads to consequent teacher expectations of children' abilities (Persell, 1977). Most of the research involving learner attitudes has utilized the pupil gain on achievement tests as the sole or primary description of changed pupil behavior, to what Galloway (1985) called "academic problems". Actually this achievement tests explore only a small portion of the cognitive domain and disregard the affective and psychomotor domains (Bloom, 1956). Burgess (1973) found that higher achieving schools are those which maximize the interaction between ability of pupils in mathematics and expert teaching in related sciences like biology, chemistry and physics. The reasons given for problems in science education include; inadequate facilities, lack of resources and money, lack of time for adequate science instruction, teachers lack of knowledge and the poor preparation of elementary teachers to teach science (Yager & Penick, 1990).

Chepchieng (1995) observes that there is a need to investigate deeply on the influence of family background on academic performance. In an effort to address the need for a supportive learning environment, the Ominde Report (1964) recommended boarding schools, because students at home may find inadequate facilities and no place for study other than the crowded family hut, no library and lack of a studious atmosphere. Since all these are characteristics of low socio- economic groups of the society, they create a socio-economic inequality that is likely to create variation in academic performance of students. Research by Brimer (1969) examined the relationship between pupils and school characteristics and pupils achievement in public examinations at "ordinary" (O-level) and "advanced" (A-level). The findings indicated that family influence of early childhood rearing were most effective in the early stages of education in relation to the child's readiness to learn. It was argued that by the time the 'O' levels were taken, most of the selective variables arising from family background and prior educational background will already have taken effect.

In Africa, it has been argued that education emphasized achievement and information acquisition, based on examination scores and academic certification (UNESCO, 1999). The findings indicated that this is at the expense of learning, which is the application, rather than the acquisition of information, concept formation and development of analytical skills (Gatheru & Shaw (1998). In addition the authors argue that examinations in Kenya major on testing factual information rather than skill acquisition. The fundamental focus of education in Kenya has been preparing people for employment rather than training for education; an unwanted side effect of this over- emphasis on examinations is that teachers may focus only on the knowledge and skills that are testable by such examinations, to the exclusion of everything else (UNESCO, 1991).

There is need for teachers to teach for understanding (Proctor, 1994). This is the ability to take knowledge, concepts, skills and facts and apply them to appropriate new situations (Kiboss, 1997). Eshiwani (1993) found that factors which influence students' achievement in science subjects and mathematics are directly related to the students' attitude towards these subjects. He reveals that factors include availability of resources such as laboratories, libraries, textbooks, laboratory equipments and chemicals. Several factors that militate for or against pupils' academic performance. Some of these factors tend to give leverage to the male-child at the expense of the girl-child (Mondoh, 2001). A girl's participation and performance in science and mathematics is influenced to varying degrees by the way she perceives Science, Mathematics and Technological (SMT) subjects in relation to her life now and in the future; by the attitudes of other students, in particular her male peers and by the attitudes of her teachers, parents and society at large (FAWE, 2004).Since independence, education reviews in Kenya have addressed the issue of gender inequality in the educational system. For instance the Gachathi report (1976) noted that the girl-child education is less developed than that of the boys. This was attributed to the traditional beliefs and prejudices held by people regarding the roles and occupations of women in society.

Numerous researchers have found gender differences in attitudes towards science, science anxiety and science achievement (Czerniak, 1989; Czerniak & Chiarelott, 1990). The Social Cognitive Theory according to Bandura (1997) suggests that the low levels of self-efficacy that many female teachers and students experience are related to gender expectations and beliefs. The findings indicated that females experience more science anxiety, have more negative attitudes towards learning science, and perform more poorly in science than males. Certain school subjects are

viewed as gender related, many science subjects for example, are often viewed as "males" subjects (Bandura, 1997). Research on gender biases in education seems to indicate that both the content of the curriculum and the delivery of the curriculum are equally important in addressing issues of efficacy and equity in science education (Carlson & Buskist, 1997). The authors observed that preponderance of women in elementary education given the high level of science anxiety among females, suggests that elementary students lack role models who can encourage positive attitudes towards science. Research on the impact of the role models on students' attitudes and performance suggest the need of career education including equity education (Proctor, 1994).

Raizen and Michelson (1994) suggested several strategies on which to increase equity in science and in mathematics, including career education in science, providing female role models in science, and teaching spatial thinking to females. Raizen and Michelson (1994) also recommended inquiry, hands-on or manipulative materials for females. Bandura (1997) also reported that increased self-efficacy and decreased anxiety could be achieved through modeling, by watching other females succeed in science, being exposed to females in science careers, or observing competent female teachers, girls may elect to take more science-related careers. Hong, Woo and Jeong (1995) reported that females favored the social-problems approach to teaching science more than did males. The authors observed that females might learn science more effectively if scientific, societal, and technological concepts were integrated into the curriculum and finally, instruction that places emphasis and lowers anxiety of science for females. Research by Enochs, Scharman and Riggs (1995) suggested that teachers need to be aware of the general classroom and school practices that encourage gender biases and point out to children gender stereotypes in texts, films, media, education materials and society as a whole

Science anxiety is a product of low self efficacy (Yager & Penick, 1985). Research on science anxiety involving over 2,000 students and 50 teachers supports the Social Cognitive Theory that low self-efficacy in science leads to high anxiety and reduced performance among many elementary students and their teachers (Czerniak, 1992). Students as early as the third grade, exhibit anxiety towards science (Czerniak, 1992), and students' interest in science starts declining between the third and seventh grade (Horton & Hutchinson, 1997). Females, as early as the third grade, exhibit more anxiety than their male counterparts (Czerniak, 1992). This science anxiety may contribute to students, particularly females, low enrolments in science related careers at higher education

(Westerback, 1984). Similarly, in other research on anxiety and performance; Westerback and Long (1982) indicated that a high level of anxiety accompanies poor student performance in most academic areas, and Spielberger and Syderman (1994) reported that highly anxious students tend to lack self confidence, curiosity and adventurousness.

Social Cognitive Theory according to Bandura (1997) suggests that anxiety is a result of feelings of inefficacy; anxiety then leads to avoidance of situations that arouse the feelings of inefficacy. Providing evidence of this relationship, some teachers reported in informal interview that they do not teach much science because they were not very good at it, they taught science only because they had to and hence they did it in a perfunctory manner, when possible they traded this responsibility with someone who was better prepared (Bandura, 1997). The impression that these teachers felt powerless to affect in a positive way, their students' science learning was disturbing but not totally surprising (Horton & Hurtchinson, 1997). Viewed in the light of research concerns, education in general and related with self-efficacy among students and teachers in particular, these teachers' attitudes and behaviors are understandable (Horton & Hurtchinson,1997).Teachers repeated negative experiences with science may include personal failure in science as a student or poor experiences with science instruction from their previous instructors (UPDATE Project, 1992). In addition to these findings, the teacher's negative experiences may include lack of adequate time allowed for preparing science teaching, lack of science content background needed to teach the subject effectively, lack of administrative support, and lack of funding for supplies and equipment. This repeated negative experiences, as a student and as a teacher, result in a low sense of self-efficacy that provides high levels of anxiety towards science and science teaching (UPDATE Project, 1992). Negative attitudes towards science teaching, poor use of allocated time, and preference for teaching other subjects may result in low self-efficacy in science instruction and high science anxiety (Westerback & Long, 1990). Thus, teachers' anxiety over teaching science is likely to have noticeable effects on both the quantity and quality of science instruction which may impact negatively on students' attitudes towards the subject (Westerback &Long, 1990).

For students who are enrolled in science classes, increases in anxiety may result in lowered achievement (Spielberger & Syderman, 1994). Lawrenz and Cohen (1985) found that students gave "difficulty" as a reason for not enrolling in science and Westerback (1982) found that anxiety increased with the increased complexity and difficulty of learning tasks. Westerback and Long

(1990) suggested that programmed learning and gradual mastery (i.e., taking tasks in small steps until skills were gained and mastered) have been shown to increase skillfulness, knowledge and confidence and to decrease anxiety Westerback (1982) found that teachers who provided clear expectations, opportunities for remediation and study support reduced anxiety towards science in the students. In summary, the use of programmed learning and mastery learning models seems to benefit not only highly anxious students but also prospective teachers (Bandura, 1997). Horton and Hutchinson (1997) suggested several classroom instructional practices that could reduce anxiety and help females and socially disadvantaged students to learn science and mathematics. These include building confidence by encouraging guessing, estimating, and testing and instruction in science that places less emphasis on "right answers" and facts which seems to build confidence in the students In teachers, anxiety about teaching science seems to be lowered after experiences with science content and science pedagogy (Goldsmith, 1986). Westerback (1984) reported that a sequence of hands- on science content courses reduced prospective teachers' anxiety about teaching science. Similarly, Czerniak (1992) found that anxiety towards teaching science was significantly lowered after completing a science methods course. Science anxiety has been established to have a bearing on both the teaching and the learning in science subjects (Nyongesa, 2010).

According to SMASSE Project (2000), biology as a science subject requires an integration of both theoretical and practical work to make it easily understood by the students. This, therefore, calls for application of a myriad of teaching aids to enable learners to concretize biological principles, concepts and facts. This requires various resources/learning materials and facilities to facilitate the teaching-learning process (Dollan & Clarke, 1979). Aiken and Aiken (1969) concluded that teachers of science, in contrast with the teachers of mathematics, generally recognized that teaching for development of favorable attitudes in the learners was an important part of their work. Newton and Tarrant (1992) observed that the attitudes and behaviors of teachers within classrooms may have a strong influence on the development of attitudes and values towards science by students. In addition the authors pointed out that the teachers' attitude towards the curriculum influence the students' attitude towards the same curriculum. There is a positive relationship between teachers' attitude and their teaching methods (Newton & Tarrant, 1992). The authors point out that a positive attitude is commonly promoted as a necessity for effective implementation of curriculum innovations.

Kangoro (2007) observed that, failure of some students to do well in biology could be attributed to the teachers' atrocious attitude towards students who ask questions in between the lesson. The author observed that some teachers gave wrong answers to students, which the students discover and end up losing confidence in the teacher. It is generally accepted that one of the most highly credited methods of classroom teaching is the use of questions, it is sad that some teachers ignore this classic methodology (Boit, 1986). It is the opportune time for teachers to redefine the art of questioning in classroom teaching (Kangoro, 2007). Traditional instructional practices that centre on teacher dominated pedagogy predominates our schools (Changeiywo, 2001). The author observes that learning activities in most secondary schools centre on the textbook and past examination papers. Linder (1992) argues that students' perceptions of physics may be affected negatively by the way the subject is presented; the author observes that this applies to all other subjects. Research on teaching behavior indicates that there are teaching methods that influence students' achievement more positively than others (Wenglinsky, 2000). The author further argues that there was a correlation between high academic achievements of students and classroom practices of the teachers.

Earlier studies on teacher effectiveness centered mainly on the personal qualities of the teacher and the performance of the student in terms of cognitive ability, for example (Bloom, 1956; Gage, 1963; Brimer, 1969; Burgess, 1973). However some researchers began to carry out systematic observation of actual laboratory and classroom activities (Kyle, Penick & Shymansky, 1979). This approach involves the reduction of teacher-student behavior into interpretable categories. It is an attempt to obtain objective, detailed, qualitative and/or quantitative descriptions of interactions that occur during the teaching-learning processes of science (Kyle, Penick & Shymansky, 1979). Lack of curiosity and innovativeness evident in many spheres of human endeavor all around us may be a reflection of the teaching methods that dulled curiosity rather than nurturing. (Ndirangu 1991). Ginsburg and Opper (1979) argue that instead of imparting factual information, the teacher should create situations where learners will ask questions, experiment and discover facts and relationships.

Kochlar (1992) argues that teaching methods should nurture an environment of students' creativity in learning. Freire (1970) reinforces this by contending that teachers should use problem-posing teaching methods that create a challenge to experiment, explore and look for links between concepts. As students look for answers, they develop functional understanding because they go

through the reasoning involved in the development and application of the concepts they learn (Freire, 1970). Students must learn how to use concepts in the solution of relevant problems (Blosser, 1989). The author argues that only through this would the learners perceive the applicability of what they are taught in school to situations of experience.

Gage (1963) noted that on the basis of efficiency as measured by percentile attainment, by lasting impression on the minds of learners, by persistence in memory (up to 56 days), by encouragement of independent thought and self reliance and by popularity among the students, the three methods rank;- experiment method, lecture method, book method. He asserted that carefully and neatly drawn diagrams do not increase the students' knowledge of science. He observed that work in elementary science must be based on daily experiences and observation by pupils. Elementary science in schools should be largely, if not entirely qualitative and not quantitative. Many studies in science education have demonstrated positive students' outcome for instructional strategies promoted in the generation of science curricula in the 1960s and 1970s. This strategies included; inquiry, open ended experimentation, students directed activities and hands-on experiences (Kyle *et al*, 1979).

From a meta-analysis of 105 studies comparing new science curricula with traditional approaches, Kyle *et al* (1979) concluded that elementary students had more positive academic and attitude outcomes when science curricula emphasized process skills. Consequently, addition of science process skills may increase efficacy, reduce anxiety and improve academic performance. Inquiry approaches to science instructions have a positive effect on students' attitude and achievement in science (Ashton, 1984). Berliner (1984) indicates that the majority of elementary teachers rely heavily on the use of lecture and textbooks. The author posits that it is essential that teachers learn to use instructional practices that positively affect science learning instead of relying solely upon the use of textbooks and lectures

Cognitive psychologists ascribe a more active role for the learner in determining whether or not effective learning takes place (Heinrich, Molenda, Russel & Smaldino 1995). Thus, the learners' previous knowledge and experiences, expectations, interests and beliefs have an impact on the way learning takes place (Ndirangu, 2000). Flanders (1970) observes that learners should be engaged in meaningful learning tasks in order to construct knowledge for themselves. The relationship between

the teacher and the pupils in the Kenyan classroom is authoritarian and impersonal (Anderson, 1970). The author observes that the underlying basis for interaction is that students have come to school to be taught, the teachers' role is therefore to tutor them. Teacher-pupil interactions are greatly affected by class sizes (Mule 1994). This is supported by the study of Eggleston, Galton and Jones (1975) who posits that learning in crowded classroom is less effective compared to one that is less crowded.

Traditionally, it is believed that in school, a child tends to compensate for the failure of the home to provide the necessary educational background, and if home background is found to be more important than schooling, it can be held to be even more responsible for the inadequacy of children's education (Cullingford, 1985). Galloway (1985) observed that schools exert a very substantial influence over the learners' behavior and attitudes, the fact that some schools have fewer problems while others are overwhelmed by problems has more to do with school factors than with factors within the catchment area of the school. School factors exert an important influence on the learners' educational progress (Nyongesa, 2010).

Teacher expectations are affected by testing and tracking procedures which are biased against some learners (Persell, 1977). In addition, the author observes that; given the less powerful position of the lower class children in society, they appear to be more negatively influenced by teacher expectations. It is not altogether surprising that teachers are commonly disappointed by the lack of parental concern and unhopeful that any further parental involvement could be beneficial (Mortimore & Blackstone, 1982). Parents meanwhile expect clear authorities from the teachers and look to them to provide the skills, behavior and attitude formations, which teachers may assume are to some extent parents' responsibility while parents may wonder about their own role and whether they are capable of helping (Persell, 1977).

The quality of teachers is dependent on the selection of top quality candidates for teaching, their pre-service education and continuous professional development (Kang'ethe & Nafukho, 2000). A study by Kariuki and Kibera (1996) revealed that 57% of a second year Bachelor of Education cohort at a local university in Kenya did not like being teachers, even after having completed their teaching practice. They ended up in this programme after failing to get their first career choices. For them, teaching was a stopgap measure while looking for better careers. Such teachers would

naturally go to school to 'work' rather than teach and would not really exert themselves in order to teach well, these points to the need for the universities and teacher-education colleges to select only those students who choose teaching as their first career choice to join teacher education programmes (Kariuki & Kibera, 1996). They opined that the kind of people, who join the teaching profession and the way they are trained, is at the heart of all problems of educational quality, which any worthwhile educational reforms in Africa, must address.

Conceptual Framework

The conceptual framework used in this study is based on the Systems Theory presented by Joyce and Weil (1980). A whole which functions as a whole by virtue of the interdependence of its parts is called a system; and the method which aims at discovering how this is brought about in the widest variety of systems has been called the General Systems Theory (Banathy, 1968). From the General Systems Theory is derived the systems concept (Mukasa – Simiyu, 2001). The independent variable is expected to bring about or account for a difference or a change in the dependent variable; the researcher builds the independent variables into the design in order to determine the effects of those factors on the dependent variables (Kathuri & Pals, 1993). According to Kothari (2003), an extraneous variable is an independent variable that is not related to the purpose of the study but may affect the dependent variable. Organismic variables are a special class of variables that appear like independent variables but are not directly controlled by the researcher (Orodho, 2005). The author opines that these variables are special extraneous variables. Figure1 shows the conceptual framework

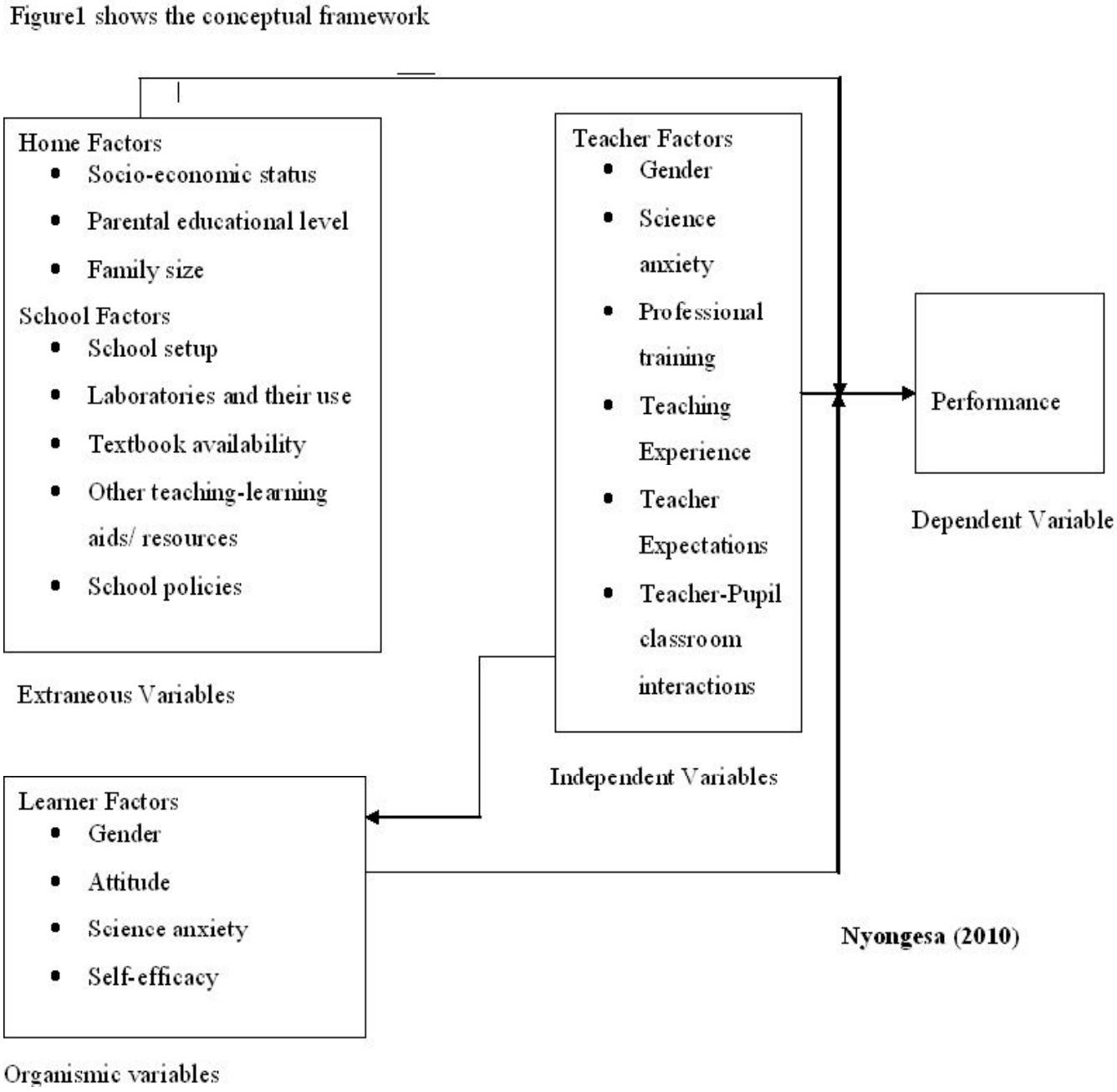

Figure 1: The Relationship between Home Factors, School Factors, Teacher Factors, Teacher Factors with Performance.

Methodology

The Cross-Sectional descriptive survey design was employed in this study. According to Wiersma (1995), this research design involves collection of data at one and only one point in time from a random sample representing some target population. The questions asked in this research design

are: What are the characteristics of the variables? What are the relationships and possible effects among the variables? In this design the treatment is included by selection rather than manipulation (Orodho, 2005). The purpose of this design is to find causative relation between events or situations. In this design it may not always be possible to assume the simple causative relation between independent and dependent variables (Orodho, 2005).

Population

There were 139 secondary schools in the district as reflected by the District Education. From the DEO's records, Bungoma district had a total of 264 biology teachers by the time of the study; out of this number 101 were female while 163 were male. This was the target population of teachers in this study. From the same records the district had a total of 9,901 form three students in the year 2007, in this population 4871 were boys and 4030 were girls. This was the target population of students in this study.

Sampling Procedures and Sample Size

The study drew the sample from the registered secondary schools as reflected by the District Education officer's (D.E.O's) office records. Table 1 shows the number of secondary schools by category according to the type of school set-up and the number of schools that were selected for study per category.

Table 1: Number of Registered Secondary Schools and Their Categories According to the School Setup.

Type of school setup	**No. of schools**	**No. of schools selected for the student sample**
Single gender boys boarding schools	10	1
Single gender girls boarding schools	18	1
Single gender girls day schools	2	1
Co-educational boarding schools	2	1
Co-educational day schools	77	3
Co-educational boarding and day schools	30	2
Total	**139**	**9**

Source: District education office, Bungoma, 2007

A representative sample of 9 secondary schools was used for the student sample. The schools were selected using the Quota sampling technique as advocated by Kathuri and Pals (1993). This type of

sampling is the equivalent of stratified sampling, with the added requirement that each stratum is generally represented in the sample in the same proportion as in the entire population (Kathuri & Pals, 1993). The objective of the Quota sampling technique is to include various groups or quotas of the population in the study (Mugenda & Mugenda, 1999). The simple random sampling technique was applied in selecting schools from each category; this ensured that all schools in the district had an equal chance of being selected for the study. Purposive sampling was used to select the teacher sample for the study. Purposive sampling is a sampling technique that allows a researcher to use respondents that have the required information with respect to the objectives of the study (Mugenda & Mugenda, 1999). The authors argue that in this sampling technique the cases are handpicked because they are informative or posses the required characteristics. Therefore in this study all teachers of biology at various levels in all the 139 schools formed the teacher sample. A simple random sampling technique as advocated by Borg and Gall (1989) and Van Dalen (1979) was applied to select the student sample. This procedure involves assigning a number or any other identifying symbol and then using the number or symbol to select the sample size (Kathuri & Pals, 1993). For schools with more than one stream, only one stream was selected using the simple random sampling technique. The students in this selected stream were respondents to the student questionnaire (SQ). 360 students from the schools were the sample size used. 35 teachers from the teacher population formed the teacher sample. Both sample sizes can be justified from the formula of Krejcie and Morgan (1970).This formula is as follows:

$$S = \frac{X^2 NP(1-P)}{d^2 (N-1) + X^2 P (1-P)}$$

in which

S= required sample size

N=the given population size

P= population proportion that has been assumed to be 0.5 as this magnitude yields maximum possible sample size required.

d= the degree of accuracy as reflected by the amount of error that can be tolerated – the value of d being 0.05

X^2= the table of value of chi square for one degree of freedom relative to the desired level of confidence, which is 3.841 for the 0.95 confidence level. This formula was adopted by Kathuri and Pals (1993).

Instrumentation

Information was collected using the questionnaire. Two categories of questionnaire were used; a Students Questionnaire (SQ) and a Teachers Questionnaire (TQ). The questionnaires had closed form items. Mark lists kept by the teachers as tracking records were used to find information on average performance up to the form three level.

The Strait – Trait Anxiety Inventory (STAI) which was part of the questionnaire was used to collect data from the teachers related to science anxiety. This is a standardized test originally developed to study the relationship between anxiety and learning. Westerback (1984) and (Czerniak 1989, 1992) adapted the STAI to measure anxiety and self - efficacy about teaching science. The STAI was used to measure the levels of science anxiety of the teachers.

Data Analysis

The data were analyzed by use of descriptive statistics. The data were analyzed using the *Statistical Package for Social Sciences (*SPSS-11.5*)* on computer. Systematical content analysis technique (Orodho, 2003) was used where the responses were classified according to meaning. In this analysis both designation and attribution of characterizations and descriptors are used (Orodho, 2003). This was necessary to underline assertions that could be characterized in a particular way. Designation was important to determine the frequency with which certain concepts were mentioned. Attribution was important to examine the frequency with which certain characterizations and descriptors were used with emphasis on descriptive phrases and qualifiers.

Background information on participants

Gender of the teachers in the study

Traditional beliefs and prejudices held by people regarding the roles, occupations and participation of women in the society have made gender issues an important aspect for consideration in the education of men and women (UNESCO, 2006). Table 2 carries information about the distribution of the teacher sample in terms of gender.

Table 2: Gender of the Teachers in the Study

Gender	**F**	**%**
Male	21	60.0
Female	14	40.0

Total	35	100.0

Data collected from the District Education Officer's (DEO's) records indicated that Bungoma district had a total of 264 biology teachers. Among this population 163 teachers (61.7%) were male and 101 teachers (38.3%) were female. Information from Table 2 shows that the biology teachers who participated in the study were males (60.0%) and females (40.0%). This information agrees with the data obtained from the DEO's Office that male biology teachers were more than the female biology teachers in the district. This could confirm the common perception that certain school subjects are often viewed as gender related. Many science subjects for example are often viewed as 'males' subjects (FAWE, 2004)

Highest academic level to which teachers pursued biology as a subject

The knowledge, the intelligence and academic excellence the teachers posses have a direct bearing on the quality of education provided by schools in any country (UNESCO, 1991). Table 3 carries information on the highest academic level to which the teachers pursued biology as a subject.

Table 3: Highest Academic Level to Which Teachers Pursued Biology as a Subject

Level	**F**	**%**
Masters Degree	2	5.7
Bachelors Degree	25	71.4
Diploma	7	20.0
Certificate	1	2.9
Total	35	100.0

The largest number of teachers (71.4%) in the district had pursued biology as a subject up to Bachelors Degree level. This implied that the teachers had good grounding content knowledge in the subject area. Information from Table 3 shows that majority of biology teachers had sufficient content of the subject by virtue of their academic level in biology.

Highest level of professional training of the biology teachers

The professional skills that teachers posses always impact on the attitude of learners towards any particular subject in the school's curriculum (Cox & Carpenter, 1989; UPDATE Project, 1992). Professional training of teachers is at the heart of all problems of instructional quality (UNESCO, 2006). The professional skills of a biology teacher contribute positively or negatively towards the levels of science anxiety of the learners (Nyongesa, 2010). The author posits that a professional teacher must have the adequate content knowledge of the subject far a head of the learners, because it takes expert knowledge to handle the attitude and science anxiety of the learners in biology. Table 4 shows the distribution of the teacher sample according to their highest level of professional training.

Table 4: Highest Level of Professional Training of the Teachers

Level	**f**	**%**
B.Ed, M.Ed	1	2.9
B.Ed, M.Sc	2	5.7
B.Sc,P.G.D.E	6	17.1
B.Ed	19	54.3
D.Ed	5	14.2
Untrained Graduate (B.Sc)	0	0.0
Untrained Diploma holder	1	2.9
Untrained Certificate holder	1	2.9
Total	35	100.0

Most of the teachers (54.3%) held a B.Ed Degree as their highest level of training. This implied that a large number of biology teachers in Bungoma district had sufficient professional training to teach biology at secondary school level.

Biology teachers by years of teaching experience

Teachers experience is always significant in the quality and quantity of instruction in the classroom (Wenglinsky, 2000). The author opines that long serving teachers are always more acquainted with the realities of classroom management. Teachers with a longer experience also display a high sense of confidence and self-efficacy in dealing with the learning problems of the learners (Bandura, 1997). The author asserts that long serving teachers also act as role models to influence pre-service

teachers and most young teachers tend to copy more from the long serving teachers in terms of professional practice. Long serving teachers may also exhibit a high sense of self- direction which is related to the level of self-efficacy (Evans & Tribble, 1986). Table 5 shows the distribution of the teachers' sample according to their teaching experience of biology in years.

Table 5: Teachers by Years of Teaching Experience.

Teaching Experience	**F**	**%**
Less than 1 year	3	8.6
1-5 years	6	17.1
6-10 years	10	28.6
More than 11 years	16	45.7
Total	35	100.0

From Table 5 the largest population of the teachers (45.7%) had taught for more than eleven years. This implies that most of the teachers had adequate experience to teach biology at secondary school level. A good percentage (28.6%) had taught biology for between 6-10 years. This means that the district had a good number of experienced biology teachers.

Gender distribution of the students

Some of the factors that militate for or against students' academic performance tend to give leverage to the male -child at expense of the girl –child (Mondoh, 2001). Against this background, this study was interested in the distribution of the student sample in relation to gender. Table 6 carries information about the distribution of the student sample in terms of their gender.

Table 6: Gender Distribution of the Students in the Study

Gender	**F**	**%**
Male	168	46.7
Female	192	53.3

Information in the Table 6 shows that the students who participated in the study were males (46.4%) and females (53.6%). In this table female students who participated were more than the males. This is because out of the nine (9) schools sampled two (2) schools were girls' only schools. This automatically gave a higher number of female students in the sample.

The number of students in terms of gender distribution in selected schools

The educational attainment of girls has been associated with the type of educational institution one attends (UNESCO, 2003). Table 7 shows the distribution of the student sample in the different types of schools selected for the study as related to their gender. The schools were identified by the numbers 1-9.

Table 7: The Number of Students in Terms Of Gender Distribution in Selected Schools.

No. of school	**Type of school**	**Gender distribution**		
	Single gender	**M**	**F**	**Total**
	Boys boarding school	40	———	40
2.	Single gender Girls boarding school	____	40	40
3.	Single gender Girls day school	____	40	40
4.	Co-educational boarding school	28	12	40
5.	Co- educational Day and boarding school	21	19	40
6.	Co- educational Day and boarding school	21	19	40
7.	Co-educational Day- school	23	17	40
8.	Co-educational Day-school	24	16	40
9.	Co-educational Day-school	11	29	40
Total		168	192	360

Information in Table 7 shows that in most co-educational schools, girls are usually the minority. This agrees with the report by UNESCO (2003). This could have an influence on the attitude and science anxiety of the girls in the learning of biology, especially when the number of male biology teachers is more than that of the female biology teachers. The subject in such a school would appear to be male dominated.

Results and Interpetation

Teacher expectations in terms of students' performance in biology

Teacher expectations have a bearing on the attitude and science anxiety levels of the learners particularly when the learners are aware of the level of expectation the teacher has of them (King&Wiseman, 2001)). Table 8 shows the distribution of the teachers' sample according to their general expectations of their students in terms of their achievement in biology at national examinations.

Table 8: Teacher Expectations in Terms Of Students' Performance in Biology

General expectation of teachers	**f**	**%**
Very low	0	0.0
Low	3	8.6
Average	22	62.9
High	6	17.1
Very high	4	11.4
Total	35	100.0

Information from Table 8 indicates that most teachers (62.9%) had average expectations of their students in terms of achievement in biology at national examinations. From this table it can also be observed that all teachers had some level of general expectations from their students in terms of performance at national examinations. The students' self-efficacy is generally linked to the teachers' expectations (Bandura, 1997).

Factors that determine teacher expectations of their students' performance

Frequent times teachers may find it difficult to know how their learners rate in comparison with those at similar schools; consequently some teachers develop inappropriate expectations as to what the learners can achieve (UNESCO, 1991). Table 9 shows the distribution of the teachers' sample according to the factors that determine their expectations of their students' achievement in biology at national examinations.

Table 9: **Factors that determine Teachers' Expectations of their Students' Performance in Biology**

Factors	**f**	**%**
Teaching experience	4	11.4
Testing and tracking of students records	23	65.7

Family background of students	6	17.1
Race of students	1	2.9
Appearance and behavior of the students	1	2.9
Total	35	100.0

Information from Table 9 shows that the largest proportion (65.7%) of teachers developed their general expectations of their students depending on the testing and tracking of students' records. Information from this table also indicates that teachers' judgment of students' academic ability may be influenced by family background of the child and other factors like teaching experience, race of the students and appearance and behavior of the students

Teaching methods most frequently used by teachers in biology

Biology as a science subject requires an integration of both theoretical and practical work to make it easily understood by the students (SMASSE Project, 2000). Table 10 carries information on the teaching methods most frequently used by the teachers while teaching biology.

Table 10: Teaching Methods Most Frequently Used by Teachers in Biology

Teaching methods	**F**	**%**
Experiment method	7	20.0
Demonstration method	4	11.4
Project work	2	5.7
Lecture method	14	40.0
Field trips	0	0.0
SMASSE(ASEI / PDSI) approach	8	22.9
Total	35	100.0

Information from Table 10 shows that the largest proportion of teachers (40%) still used the conventional lecture method while teaching biology. This is contrary to the recommendations of curriculum developers and the Quality Assurance and Standards directives. It is expected that through field trips the learners would acquire attitudinal skills; however none of the teachers (0.0%) frequently used field trips to teach biology. This could be attributed to financial constraints and many schools could not afford to take students for frequent field trips. Only (22.9%) of teachers had

embraced the ASEI / PDSI approach as advanced by the SMASSE Project (2000). This implies that the Ministry of Education in conjunction with other stakeholders should organize for more in-service seminars for teachers on this teaching approach. This approach has been recommended by the Ministry of Education and most teachers had been in-serviced. This approach emphasizes a learner centered teaching methodology that integrates hands-on activities, eyes-on activities and experimentation with one of its main objective being to change the attitude of the learners by their teachers through this new teaching approach (SMASSE Project, 2000)

Factors that elicit negative attitude of students towards learning biology

In relation to the teaching and learning of biology, attitudes begin to develop on the first encounter between the teacher and the learner, once formed they play a key role in determining students' learning and performance in biology (Nyongesa 2010). Table 11 carries information, which according to the teachers could be some factors that could elicit negative attitudes of the students towards teaching biology.

Table 11: Factors that Elicit Negative Attitude of the Students towards Learning Biology.

Factors	**f**	**%**
Quality of teaching methodology frequently used.	10	28.6
Authoritarian and impersonal teacher- student interaction in class.	13	37.1
Large class size that minimize teacher- student interaction in class.	12	34.3
Total	35	100.0

Information from Table 11 indicates that most teachers (37.1%) observed that authoritarian and impersonal teacher- student interaction in class could be the major factor that contributes to negative attitude of the students towards learning biology. Quality of teaching methodology frequently used and large class sizes also contribute significantly in the formation of negative attitude of the learners towards the teaching of biology.

Factors that elicit positive attitude of the students towards learning biology

Attitudes are very important for effective learning; a negative attitude towards learning biology makes the learners to dislike the subject and may not appreciate the efforts of teachers in assisting

them to achieve higher in the subject while a positive attitude will make the learners to like the subject and put in more effort to compliment the work of the teachers (Twoli, 1996). Table 12 carries information that according to the teachers are some factors that could elicit positive attitudes of the students towards learning biology.

Table 12: Factors that Elicit Positive Attitude of the Students towards Learning Biology

Factors	**F**	**%**
Quality of teaching methodology frequently used.	10	28.6
Democratic and personal teacher- student interaction in class	13	37.1
Small or medium sized classes that maximize teacher-student interaction.	12	34.3
Total	35	100.0

Information from Table 12 indicates that democratic and personal teacher-student interaction in class elicits positive attitude towards learning biology. This according to the teachers could be the major factor that contributes to positive attitude. The quality of teaching methodology frequently used, teacher-student interaction in class and class sizes could have an influence on the attitude and science anxiety of the learners towards biology (Nyongesa, 2010). The quality of classroom life, teachers' attitude and teaching style and class sizes are all important but from Table 11 and Table 12 it is apparent that the type of teacher-student interaction in class seems to be a stronger indicator of educational quality in biology classes.

Factors that elicit science anxiety among teachers in their teaching of biology

The teaching approach, methodology and how the professional skills and practices of the teacher are displayed may be dependant on the level of science anxiety the biology teacher has (Nyongesa, 2010). Table 13 carries information that shows the distribution of the teacher sample on the main causes of science anxiety in their teaching of biology

Table 13: Factors that Elicit Anxiety among Teachers in their Teaching of Biology.

Factors	**f**	**%**
Lack of adequate teaching time	8	22.9

Lack of adequate content background	4	11.4
Lack of professional training.	1	2.9
Lack of sufficient laboratory equipment and apparatus	11	31.4
Long and congested syllabus.	11	31.4
Total	35	100.0

From Table 13 a large proportion of teachers (62.8%) observed that a long and congested biology syllabus and lack of sufficient laboratory equipment and apparatus were major causes of anxiety in their teaching of biology. Some teachers (22.9%) felt that lack of adequate time allowed for teaching biology could be their cause for anxiety.

Teachers' Perceptions of the students' attitude towards biology of both genders

Teachers always have first hand information as regards their students (Jung, 2000). Table 14 carries shows the distribution of the teacher sample on how they perceive the attitude of students towards biology in relation to the students' gender.

Table 14: Teachers' Perceptions of the Students' Attitude towards Learning Biology related to the Students' Gender.

Teachers' Perceptions	f	%
Boys have more positive attitude than girls.	16	45.7
Girls have more positive attitude than boys.	10	28.6
There is no difference in attitude of the boys and the girls	5	14.3
No response / NA	4	11.4
Total	35	100.0

Information in Table 14 indicates that a large proportion of the teachers (45.7%) opine that boys have more positive attitude than girls towards the learning of biology. Some teachers (28.6%) observed that girls had a more positive attitude than boys towards the learning of biology.

Teachers' Perceptions of the students' performance in biology of both genders

Numerous research findings have in the past indicated disparities in performance in SMT subjects in relation to the gender of the students (FAWE, 2004). From these findings, boys generally perform better than girls in these subjects. Table 15 carries information that shows the distribution of the teacher sample on how they compare the performance of their students in biology as related to the students' gender.

Table 15: Teachers' Perceptions of the Students' Performance in Biology related to the Students' Gender.

Teachers' Perceptions	f	%
Boys perform better than girls.	18	51.4
Girls perform better than boys.	10	28.6
There is no significant difference in performance between boys and girls.	3	8.6
No response / NA	4	11.4
Total	35	100.0

Information from Table 15 indicates that a larger proportion of teachers (51.4%) opine that boys perform better than girls in biology tests, assignments and national examinations. While (28.6%) of the teachers held a view that girls performed better than the boys.

Teachers' Perceptions about influence of teachers' gender on learning in biology

Teachers need to be aware of the general classroom life, personality types and school practices that encourage gender biases (Obura, 1991). The author asserts that teachers should be aware of and point out to the children gender stereotypes in texts, media, education materials and society as a whole. Table 16 shows information regarding the perceptions of teachers on how the gender of the teacher influences the learning of students in biology.

Table 16: Teachers' Perceptions about the Influence of The Teachers' Gender on The Learning in Biology.

Teachers comparison	f	%
Male students prefer male teachers	3	8.6
Female students prefer male teachers	5	14.2
Male students prefer female teachers	2	5.7
Female students prefer female teachers	3	8.6
Teacher's gender has no influence on students' learning in biology	22	62.9
Total	35	100.0

From Table 16 the largest proportion of (62.9%) the teachers opine that teacher's gender has no influence on the learning of biology. Therefore the teaching and learning process according to these teachers is not influenced by the teacher's gender.

Teachers' reasons for dissatisfaction in relation to the teaching of biology

Career or job satisfaction contributes a lot to achievement of the anticipated results (UNESCO, 1991). A teacher who suffers from career dissatisfaction is likely to contribute negatively in terms of performance of the learners in biology; this is because the teacher will have lower self-efficacy and high levels of anxiety. This kind of teacher is likely to develop negative a attitude towards the students and his/her interaction with the students will be negative and this may contribute to a negative attitude of the students towards biology with the likelihood of the students developing high levels of anxiety towards the subject(King & Wiseman,2001). Table 17 shows the distribution of the teacher sample regarding the reasons the teachers had that could make them to have dissatisfaction with the teaching career as relates to the teaching of boil

Table 17: Teachers' Reasons for Dissatisfaction in Relation to the Teaching of Biology.

Reason for dissatisfaction	**f**	**%**
Low salary scale	3	8.6
Teaching was a last option career choice	6	17.1
Low achieving students cause discouragement and burn- out	19	54.3
School administration never involves teachers in decision-making.	3	8.6
Biology is not my main teaching subject	4	11.4
Total	35	100.0

Information in Table 17 indicates that there are various reasons that can cause teachers' dissatisfaction as related to the teaching of biology. This information indicates that a larger proportion of the teachers (54.3%) were affected by low achieving students who cause discouragement and burn- out. Discouragement and burn-out caused by low achieving students was cited as a main cause of dissatisfaction in relation to the teaching of biology. Some teachers (17.1%) indicated that teaching was their last option career choice. This implies that for these teachers, teaching was a stopgap measure while looking for better careers. Such teachers will natural go to school to 'work' rather than teach and would not exert themselves in order to teach well (Wenglinsky, 2000). This point to the intrinsic aspects of the job.

Science anxiety levels of the biology teachers

Science anxiety has been related to the teachers' performance in science, highly anxious teachers tend to lack self confidence, curiosity and creativity in their teaching approaches (Spielberger & Syderman, 1994). Table 18 shows the mean scores of the levels of science anxiety that biology teachers had as related to their gender. The table shows the mean scores and numbers of valid responses to the STAI in measurement of the levels of science anxiety of the biology teachers.

Table 18: Means Scores Of The Levels Of Science Anxiety Of Biology Teachers.

Variable	Gender	Mean	N
Anxiety scale	M	2.1	21
At ease – anxious	F	2.6	14
1-2-3-4-5-6-7			
Confidence scale	M	2.2	21
Confident-fearful	F	2.4	14
1-2-3-4-5-6-7			
Interest scale	M	2.2	21
Curious – uninterested	F	2.4	14
1-2-3-4-5-6-7			
Total mean scores	M	**6.7**	
	F	**7.6**	

Mean scores for the anxiety scale, confidence scale and interest scale are higher for the female teachers than the male teachers. The total scores of the means are higher for the female teachers (7.6/21) as compared to the male teachers (6.7/21). This implies that female biology teachers have a higher level of science anxiety in relation to the teaching of biology. This is likely to have noticeable effects on both the quantity and quality of science instruction which may impact negatively on the students' attitude towards the subject (Westerback, 1984). Figure 2 shows the general performance of students in biology since joining form one in relation to their gender.

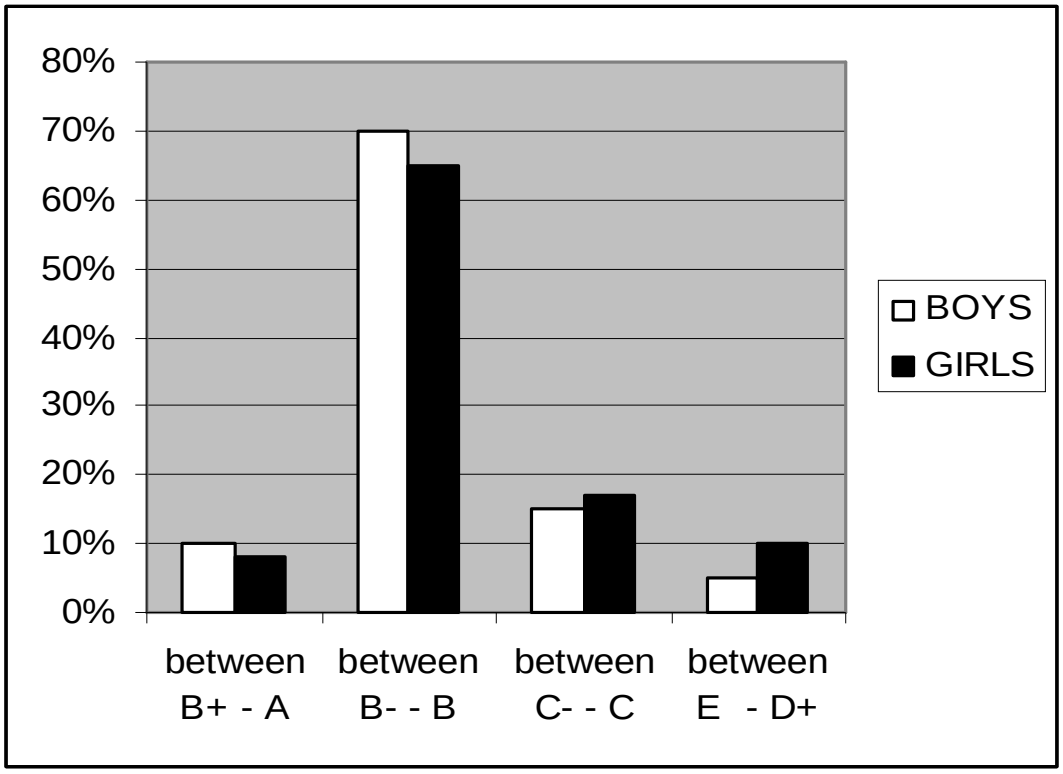

Figure 2: The General Mean Grade Performance in Biology of the Students.

Information in Figure 2 indicates that male students had an overall better performance than the female students in biology. For the higher grades between B+ and A the male students had (10%) representation while the female students had (8%) representation. The female students on the other hand had a higher representation in lower grades. The lowest category of the grades between E and D+ the female students still led by (10%) while the male students had (5%) representation. This implies that biology is among the gender related science subjects.

Reasons for disliking biology as related to the students' gender

While it is true that the largest proportion of students liked biology, there were a proportion of them who disliked the subject. Table 19 shows the distribution of the student sample according to the reasons that made them to dislike biology. The table shows the distribution in relation to the students' gender.

Table 19: Reasons for Disliking Biology as Related to the Students' Gender.

	Gender M		Gender F		Total
Reason	**F**	**%**	**f**	**%**	

Poor teaching foundations given in form one	34	20.2	46	23.8	80
Difficult scientific terminology	66	39.3	96	50.0	162
The teacher express very high expectations of the students in terms of performance	19	11.3	18	9.5	37
Authoritarian and impersonal teacher- student interaction in the classroom	49	29.2	32	16.7	81
Total	168	100.0	192	100.0	360

Information in Table 19 reveals that male and female students had diverse reasons for disliking biology. However some reasons stand-out as common for both genders. Table 19 also reveals that forty nine male students (29.2%) and thirty two female students (16.2%) disliked biology because of the authoritarian teacher -students' interaction in class. This implies that most male students were negatively influenced by the authoritarian teacher- student interaction in the classroom.

Factors that determined students' attitude towards biology related to gender

Table 20 shows the distribution of the student sample according to the main factor that determined their attitude towards learning biology as related to their gender.

Table 20: Factors that determined Students' Attitude towards Biology related to Gender

	Gender M		**Gender F**	
Factor	**F**	**%**	**f**	**%**
Teaching methodology frequently used	34	20.0	39	20.0
Career prospects and choices	116	70.0	96	50.0
Kind of teacher-student interaction in the room	8	5.0	38	20.0
Level of expectation	8	5.0	19	10.0

the teacher has from students in terms of performance				
Total	168	100.0	192	100.0

Information in Table 20 shows that most students' attitude was due to the high career prospects and choices that biology offers. This implies that most of the students of both genders were intrinsically driven to study biology because of the high career prospects and choices. Information in Table 20 also reveals that the teaching methodology frequently used is an important factor determining student's attitude towards learning biology. Thirty four (20.0%) of the male students and thirty nine (20.0%) of the female students held a view that the teaching methodology frequently used influenced their attitude towards biology. The kind of teacher – student interaction in the classroom tended to have higher influence on the attitude of the female students (20.0%) as compared to the male students (5.0%). The level of expectations the teacher had from the students in terms of performance also seemed to influence female students' attitude more than that of the male students.

Discussion of Research Findings

In a classroom setting, academic performance in biology varies from one student to another (Nyongesa, 2010).The author posits that this occurrence is usually observed despite the fact that the students are subjected under the same syllabus, curriculum and school facilities among other factors. This suggests that variability in academic performance in biology from one individual student to another can be attributed to other factors such teacher related factors. In this study it was found that girls are minority in co- educational schools. This finding is similar to that of UNESCO (2003). The report indicated that in most co- educational schools girls are usually the minority and hence there is a strong gender bias in subject choices available for girls. According to UNESCO (2003) there are three main reasons why male students always dominated co-educational schools. First, that there is cultural proclivity for seeing talk by women as too much talk. Second, social pressure requires that females could be good listeners and their verbal participation is seen as less important. Three, women are discouraged from talking by verbal and non-verbal messages such as delayed feedback, speech interruptions and withholding of active listening responses like nods or just by gazing at them.

Influence of Teachers' Perceptions on Performance in Biology in terms of Students Gender

This study found that teachers' perceptions and comparisons about the performance of their students in biology rated the boys higher than the girls. This finding is similar to that of Nanda (1991).The teachers' influences at school have also been found to be a hindrance to girls' option for science and mathematics (Boit, 1986). Studies have shown that teachers tend to carry the societal expectations of girls into the school and therefore treat boys different from girls (Whyte, 1984). Some teachers are said to actually discourage girls by uttering statements like "mathematics and science are not meant for girls" (Wamahiu, Opondo & Nyagah, 1992). The negative societal perceptions regarding female involvement in science and technological fields are also transmitted within the educational system through books. According to a study carried out in Kenya by Obura (1991), it was found that textbooks in schools are a major socializing factor in the lives of children. First and foremost the text books present models of people. They present behavior and thought patterns which they imply are good to copy. The school as a social institution is authoritative and the textbooks used there carry authoritative messages on role models. It was established from the teachers that boys have a relatively more positive attitude than the girls. This finding is similar to those of Banu (1985), Kwon (1904) and those of Horton and Hutchnison (1997). Lucas and Dooley (1982) asserted that women report less positive attitude towards science than do men.

Influence of Teaching Methodologies on Learning and Performance in Biology

Whyte (1986) established that certain teaching styles and methods tend to favor boys. The findings in this study indicated that most teachers of biology still use the traditional lecture method. The fact that boys had a more positive attitude towards biology as compared to the girls agrees with the findings of Whyte (1986). The author asserted that boys show greater adaptability to traditional approaches of teaching which require memorizing abstract and unambiguous facts which have to be acquired quickly. Boys are more willing to sacrifice deep understanding of correct answers achieved at speed. Chepchieng (1995) asserted that early socialization which children are taken through tends to make them develop attitudes that tend to support to the mistaken notion that mathematics and sciences are not for girls. This makes the girls to have a negative attitude towards science subjects but concentrate on other subjects.

Influence of Teacher-Pupil Classroom Interactions on Learning and Performance in Biology

Students of both genders who reported their dislike for biology cited the authoritarian and

impersonal teacher – student interaction in class as the main causes for negative attitude towards the subject. Anderson (1970) established that the relationship between the teacher and the pupils in the Kenyan classroom was authoritarian and impersonal. In addition he observed that the underlying basis for interaction is that the students have come to school to be taught, the teachers' role is therefore to tutor them rather than to provoke them to learn. Students are not treated as thinking human beings that had their own views and experiences, which could be used to lead them, see the relevance of the new information they are learning (Anderdson, 1970). Seli (2006) observed that teachers as role models were responsible for formation of positive attitudes towards a curriculum. Teachers' behavior and teaching practices have significant implications for female students' persistence, academic achievement and attainment (FAWE, 2004).

Most teachers have differential expectations for students' responses in activities like teacher-led class discussions, where boys are spoken to more frequently and asked higher order questions (Kombo, 2004). This definitely discourages the girls and leads to a relatively lower attitude. These differential expectations about the students in reference to their gender are a reflection of the broader societal biases about the role of women in society and the academic capacity of girls.

Influence of Teacher Expectations on Learning and Performance in Biology

Findings of UNESCO (2003), observed that male and female teachers believe that boys are academically superior to girls; classroom observations in Kenya indicated that most teachers pay more attention to boys than girls or completely ignore the girls. At times boys received more attention in the distribution of text books and other learning materials and at times teachers reinforce the belief that girls lack spatial and analytical thinking (UNESCO, 2006). This is internalized and conclusively accepted thus justifying the self – fulfilling prophecy that there are certain subjects that are not for girls. Failure or success can be created by how the teachers' expectations could influence the attitude of the learner towards biology and contributes towards the learners' anxiety in biology (Nyongesa, 2010). The potential for the self-fulfilling prophecy effects of the teacher expectations exists when these expectations are inaccurate and inflexible, this could have damaging consequences for the students' educational performance (Proctor, 1994).

In this study it was found that most teachers did not have high or very high expectations of their students in terms of academic achievement in biology. Most teachers were found to have average

expectations of their students. Studies have shown that teacher expectations have a bearing on the attitude of students towards learning. Webster (1966) found that children achieved higher levels of academic success in schools where the teachers made it obvious that they expected a high proportion to do well in public examinations. It was noted that children are likely to work better if taught in an atmosphere of confidence that they can do well in tasks set for them (Webster, 1966). Wenglinsky (2000) pointed out that individuals tend to achieve a higher level of academic success when the expectation that they will succeed at a learning task is communicated to them. He observed that the teacher must convey his honest belief on his part that the students can achieve highly in the tasks. . Teachers' experience is an important factor that may determine teacher expectations; new inexperienced teachers but well intentioned may be socialized by older teachers into their own negative attitude towards the learners (Nyongesa, 2010).The author opines that, the main reason that determines teacher expectations of the students can have obvious educational implications that could be negative or positive in terms of performance. Some teachers could spend more time interacting with students for whom they have higher expectations (Persell, 1977). Nyongesa (2010) observes that these expectations could influence the attitude and the science anxiety of the learner as related to biology.

Westerback and Long (1990) found that socially disadvantaged learners have a greater need for more immediate gratification of reinforcement. Learning can be improved when they received frequent conformations of their achievements or gains; this improves on the positive attitude of the learners. They further suggested that the teacher should plan learning activity so that short range goals are clearly obvious to students. From the findings of this study it can be concluded that boys perform relatively better than the girls in biology because they have a relatively more positive attitude than the girls towards the subject.

Influence of the Science Anxiety of the Teachers on Learning and Performance in Biology

This study found out that female teachers exhibit higher levels of science anxiety to towards the teaching of biology, as compared to the male counterparts. This findings are similar to those of Gorrell and Capron(1990).Science anxiety is a product of low self-efficacy (Yager & Penick, 1985). Bandura (1997) developed the Social Cognitive Theory from a programmed research on social development that had spanned several decades. The major construct emerging from this research is the construct of self-efficacy, a cognitive processing mechanism that guides human action. Self-

Efficacy, according to Bandura (1997) is one's perceived performance capabilities in a given situation or activity. This perceived performance capability affects behavior and attitude. According to Bandura (1997) people gather information about their self-efficacy in various ways. He observes that through various experiences; people observe others succeeding or failing in given situations and develop expectations for their own performance accordingly.

Gorell and Capron (1990) defined teacher self-efficacy as a belief that one's abilities can bring about positive changes in students behaviors and achievement. Teachers may believe that the environment and other factors beyond their control limit their abilities to bring about change in children. Such teachers feel helpless and give up trying to help children learn. Gorell and Capron (1990) suggested that without a belief in their ability to affect student performance, teachers do not accept responsibility for motivating students' learning. High levels of self-efficacy have been associated with greater student achievement and greater teacher commitment to student achievement as well as higher expectations for children Ashton, Webb & Doda 1983). The authors assert that teachers with a high level of self-efficacy seemed to take personal responsibility for student's learning. They tended to feel that if a student was not learning, it was not the student's fault or deficiency, but the inappropriateness of the teaching method, and these teachers changed their methods until success was reached. In other words, they persisted in helping students with difficulties in learning, and they were less critical in their feedback when students gave wrong answers. (

Gorell and Capron (1990) found that teachers with higher self-efficacy had a strong academic focus in their classrooms; they used games for instruction, used more innovative teaching techniques, monitored student's performance more closely, and taught by whole class instruction than teachers with lower self-efficacy. In addition, the authors believed that the behaviors, which are closely related to those in the effective school literacy, provided more supervision and resulted in more on-task behavior and less loss of time in transition from one activity to another. Finally, higher level of teacher self-efficacy was associated with better lines of questioning; high-efficacy teachers were better able to lead children to answers and were less likely to give students answers than low-efficacy teachers (Gorell & Capron, 1990). The sources of teaching dissatisfaction may be similar irrespective of the teachers overall level of dissatisfaction. (Westerback, 1994). However this could be issues of importance to all teachers or at least to most and not just to those who report a high

satisfaction at work; a sense of job satisfaction may enhance the teachers' quality of teaching (Nyongesa, 2010). On the other hand, a feeling that you are doing a good job as reflected by the good performance of the students may be an important source of satisfaction (Westerback, 1984). While job satisfaction will not necessary help a person become a better teacher, consistent lack of satisfaction at work may be associated with frustration and ultimately with the apathy associated with burn- out and this will influence the quality of instruction (Wenglinsky, 2000).

Teachers with low levels of self-efficacy demonstrated less commitment to helping students learn (King & Wiseman, 2001). They gave up quickly on children who failed and gave students answers rather than waiting for a response (Gorell & Capron, 1990). These teachers according to these authors exhibited lack of "witticism", that is, they often failed to recognize task behavior in their classrooms while working with small groups and preferred more rigid behavior controls. Results of studies on science anxiety have been consistent with studies of self-efficacy in general (Nyongesa, 2010) Poor self-efficacy may lead to science anxiety, thus providing a possible explanation for fewer entries into scientific careers (Guyton, Fox & Sisk, 1991). The authors found that pre-service teachers' level of efficacy could be increased by using self-directed learning. This type of self directed instruction may be beneficial in raising pre-service teachers' levels of efficacy and should be tried in other educational settings. Research on the impact of various experiences on self-efficacy and effective performance suggests that role models for effective science teaching, especially for elementary teachers, are a necessary component in teacher education (Bandura, 1997). Many studies in education have determined that role models, especially in the field setting, greatly influence teachers, for example Evans and Tribble (1986) summarized research in teacher education and concluded that role models such as co-operating teachers influence pre-service teacher's more than theoretical preparation on campuses.

Teachers with high self-efficacy believe that they can control their own classroom management skills, and they plan and select curriculum effectively (Ashton, Webb & Doda, 1983). Teacher education programs need to prepare teachers for the realities of classroom management, particularly in science. For example, if a teacher with a low sense of efficacy becomes easily flustered by classroom interruptions of routine and prefers rigid environments, this teacher would probably be easily bothered by hands-on instruction, open-ended instruction, or other less rigid teaching strategies shown to affect positively the attitudes and achievement in children (Ashton,

1984).Experiences with management and control of science classes, which differ in some ways from other subject areas due to the laboratory, inquiry-based nature of science, should be an integral part of teacher education courses (Ashton, Webb & Doda, 1983). Therefore, it is crucial that pre-service teachers have experiences with exemplary practicing science teachers. The degree of self-direction is also related to levels of efficacy (Ashton, 1984). The author reported that the structure of organization in schools can affect teachers' sense of efficacy. Teachers often believe that they have little control over decision-making that takes place in school. Teacher educators should address this concern by involving prospective teachers in discussions of ways to influence classroom and curricula decisions and ways to cope with the subordinate position of teachers in the school structure (Orodho, 1996).

Conclusions

Emerging trends according to the findings of this study indicated that the gender of the teacher and the teaching experience in years in this age of science education, were not the key factors that influenced performance of secondary school students in biology directly but rather indirectly. Teacher perceptions, teaching methods applied, the type of teacher –pupil classroom interactions, teacher expectations of students in terms of performance and science anxiety levels of the teachers-partly contributed by lack of job dissatisfaction or satisfaction were the key factors that influenced performance in biology.

The conclusions made were based on the findings of the study as presented and discussed. A basic question relates to the proper role of the biology teachers in enhancing the learning of biology. What criteria should guide us in determining what the teacher can try to do, much less what he or she can do? Where must the teacher begin? Can the biology teacher effect sufficient change of attitude and learning behavior in biology? There is no sufficient understanding of the effects that various teaching practices have on raising or lowering student attitude and science anxiety gender-wise. From this; it is inevitable to conclude that the students, the teachers, the school and the parents have a crucial role to play towards successful achievement in biology (Nyongesa, 2010).

It can also be concluded that if we measure the cost in terms of unfulfilled human desires, underdeveloped capabilities and unexplored potential for improving the quality of biology education, any amount of money needed to do the job will be well worthy the expenditure. This is

in consideration of the fact that, we are living in an age in human history of high technology and industrialization where biology education plays a key role (Nyongesa, 2010). The author posits that for better students' achievement in biology, the teacher should not be isolated and the parents' role should not be taken for granted. It is inevitable to conclude that the parents and the community must forge a clear working relationship with the teachers and with the school. It must be accepted that the parents which in essence are part of the community are key components in the professional work of teachers who are also products of the community. The traditional role of the school is conceived to be that of transmitting the culture and a conservator of the existing social system, and all the consequences which ensue. (Nyongesa, 2010). On the other hand, the learning problems with which the school must deal with do not exist in isolation, the school where the teacher is found should act as a locus of activity in coordinating the solutions to these problems (Nyongesa, 2010) The author opines that therefore teachers of biology must consider the emotional, social and intellectual constructs if we are to examine the total educational goal of schools in a free society. The instructional materials should be free of gender biases and stereotypes.

Finally, it can be concluded that for some students very high teacher expectations in terms of their performance makes them to like subject, this implies that this kind of students knew that they can measure to the teachers' expectations (Nyongesa ,2010). The author further posits that, for those students who knew that they are unable to measure up to the teachers' expectations they tend to dislike the subject. Figure 3 shows the inter-relationship between the genesis of teacher expectations of the students, their outcomes and their influence on performance in biology as envisaged by this study.

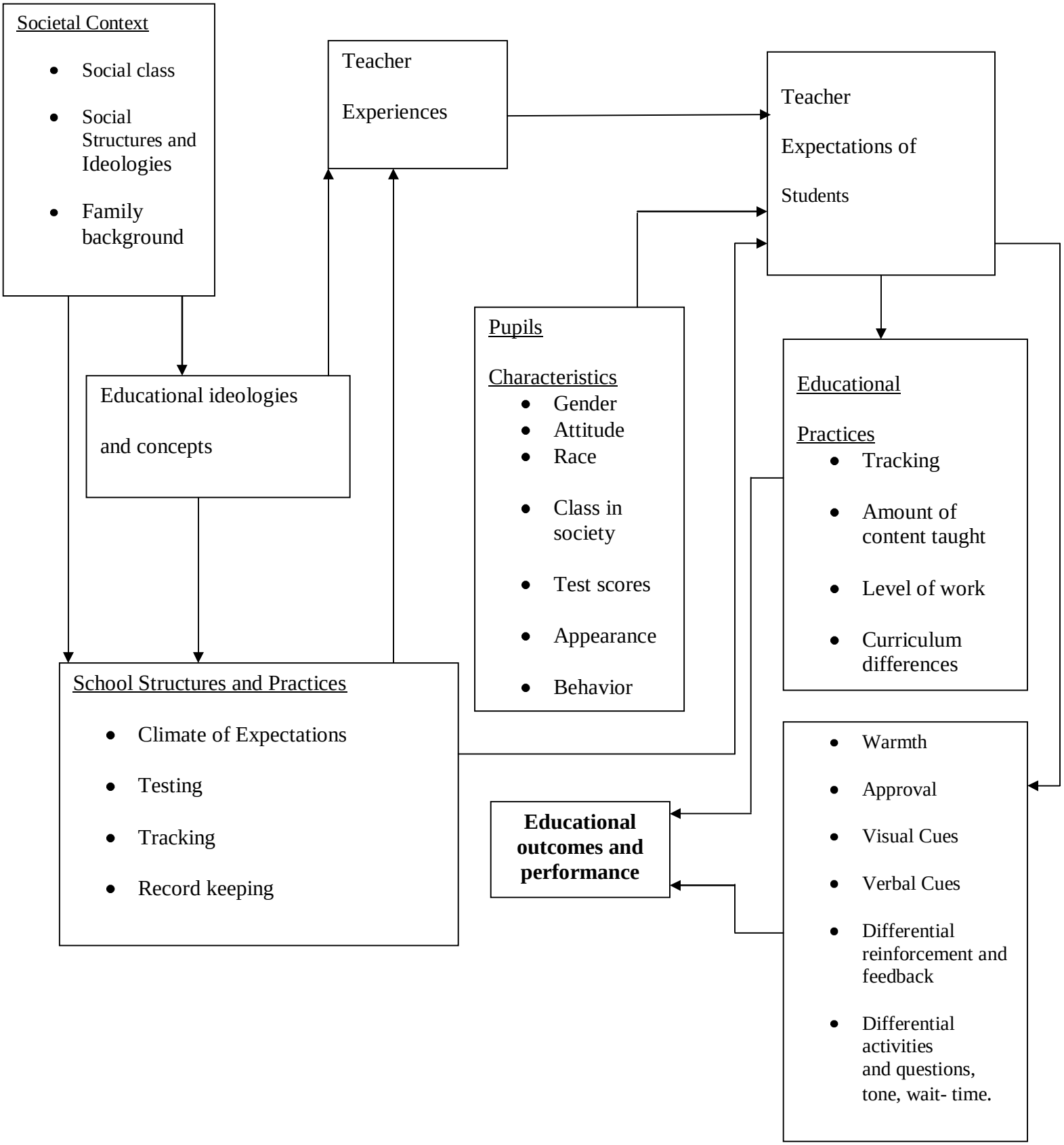

Figure 3: Inter-relationship between Genesis of Teacher Expectations and their outcomes

Recommendations

Most children have some difficulties. Teachers on the other hand are not perfect, and schools being institutions (however child centered) can not be ideal for every child all the time. Given normal attention, most problems can be dealt with. Some avenues are listed below without elaboration at this point.

(i) Since teachers are much a product of societal attitudes as the students, they should be empowered to take up the responsibility of implementing the relevant changes in their classrooms, schools and institutional communities in order to participate fully in promoting gender equity and equality in education and training from a life cycle approach. Such an approach in engendering the education system is likely to yield greater returns among generations of students.

(ii) It is important that researchers are brought on board when it comes to education policy planning and implementation.

(iii) The government has to put in place systems to ensure gender mainstreaming in education. The little known National Task Force on Gender, Education and Training, has remained moribund since it has set up in 1994. It must be revived so that it can provide the guidelines for gender mainstreaming in education. Without putting in place such strategies, achievements of EFA and MDGs on Industry and Higher Education will continue to remain a pipe dream.

(iv) Teachers of biology should provide opportunities for all children to participate in demonstrations and experiments. The students should be given recognition for their projects by having their exhibits displayed to other pupils as well as to their parents at periodically organized community science fairs. This helps to tap the creative skills and abilities of the children.

(v) The Ministry of Education and policy makers should ensure that the instructional materials, the curriculum and examinations are gender sensitive. This calls for the need to develop a criterion for evaluating gender – biases and stereotypes in instructional materials especially textbooks for all the National Curriculum Development Centers and Examination Council.

(vi) The creativity teaching approach that will prepare students for industrial work should be embraced by teachers of biology in an attempt to motivate their students and boost the attitude of the learners in biology.

(vii) Teachers of biology should embrace the ASEI /PDSI approach as advanced by the SMASSE Project which can improve on students' attitude and creativity much required in Industry, to bridge the gap in The Global Economy.

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E2012-43: **An Inviting School in Urban Low Socio-Economic Setting: A Case Study of A Public Primary School In Kibera Slum, Kenya**

Okaya, T. Mboya
Australian Catholic University, mboya2011@gmail.com

Abstract

Truly inviting schools do exist in growing numbers throughout the United States, Canada, South Africa, Hong Kong and other countries. These schools do not happen by accident but are the products of optimism, trust, respect, care, and purpose(Purkey & Novak, 2008). Invitational education is a significant and relevant theoretical model of practice that addresses the total educational environment: social, physical, cognitive, spiritual, and emotional (Smith, 2011). Developed by William W. Purkey, Invitational Education is democratically oriented, perceptually anchored, self-concept approach to the educative process. Democracy is a social ideal based on the