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THE RELATIONSHIP BETWEEN TEACHER-RELATED FACTORS AND STUDENTS' ATTITUDES TOWARDS SECONDARY SCHOOL CHEMISTRY SUBJECT IN BURETI DISTRICT, KENYA

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Abstract

This paper examines the relationship between teacher-related factors and student's attitudes towards Chemistry subject in secondary schools in Kenya. The paper is based on a study conducted in Bureti District in Kericho County, Kenya. This paper highlights issues on the teaching methods used by chemistry teachers, the teachers' availability to attend to various needs of students on the subject, their use of teaching and learning resources in teaching, teachers' personal levels of skills and knowledge of the subject matter in Chemistry and the impact of students' negative attitudes towards Chemistry on teachers' effectiveness. The research design used in the study was descriptive survey. The target population comprised Form Four students in ten selected secondary schools in Bureti District of Rift Valley Province Kenya. Stratified random sampling technique was used to select the study sample. Schools were selected from the following categories: Girls' schools, Boys' schools and Co-educational schools. Simple random sampling was used to select the respondents from Form Four classes as well as a teacher in each school. In all, one hundred and eighty-nine students and ten teachers filled the questionnaires. The data collection instruments were questionnaires based on the Likert scale and document analysis. Data was analyzed descriptively using frequency tables, means and percentages while hypotheses were tested using Analysis of Variance. From the study findings, a number of indicators revealed that there are some factors influencing students' attitudes towards Chemistry, including lack of successful experiences in Chemistry, poor teaching. It was recommended that science teachers' should encourage development of positive self-concept of ability among students. Among other recommendations, the study suggests that guidance and counselling of students in schools should be encouraged, to ensure positive attitudes towards and full participation by girls in, the subject. The findings of this study will be beneficial to the curriculum developers, Kenya Institute of Education as well as Chemistry teachers.

Keywords – Teacher Factors, Students Attitudes, Secondary School Chemistry Subject, Bureti District, Kenya.

1 INTRODUCTION

Science is a major factor for change in the modern world. There is an increasing demand for professional practicing scientists everywhere, as well as a need for others to be educated in these fields. There is rapid increase in scientific knowledge, which has resulted in a mass of new materials being incorporated into the school syllabus. When considering science curriculum improvement in Kenya, it is essential that the science curriculum provides the kind of learning which relates the student to his environment and that which enables the individual after school to play a meaningful part in the development of this country using scientific knowledge.

The desired curriculum is therefore that which can satisfactorily expose the individual student to the scientific and technological methods-observation, abstract and verification using topics that have relevance to the Kenyan situation. What is more desirable is to have a science-teaching programme, which provides opportunity

of introducing students to become active participants in science. Science laboratory classes should study different techniques and equipments and careful investigation – keen observation, accurate recording and good thinking.

Scientific work demands consistent work and effort. It is better to establish this fundamental concept in the mind of the student. This requires us to understand and to apply scientific knowledge rather than pass examination. Science affects all aspects of human life. Every person in society requires scientific knowledge in order to fit in the present society. The approach towards improvement of the science curriculum must start right back at the lower levels of education if changes at the advanced levels are to be effective. Given the changing job market, many women could thus be disadvantaged in their later lives if they have not pursued the required level of science proficiency. This is perhaps significant because a higher proportion of women today need to be wage earners due to changes in family structure and social role expectations. Many need to be secure in their jobs and financially independent (Njuguna, 1998).

Chemistry, as a science subject, is like a pivot in the Kenyan secondary schools curriculum since other subjects such as Physics, Biology and Agriculture depend on it. The study of Chemistry involves pursuit of truth hence instils diligence, patience and objectivity among learners. Chemistry learning develops the scientific habits in students, which are transferable to other areas in life. Such habits involve non-reliance on superstition, critical thinking and respect for other people's opinions. The above qualities when learnt help solve many problems of individual and social living (Das, 1985). Chemistry also prepares students for vocations and careers at tertiary levels of learning and in life generally. The teaching of Chemistry should therefore be done such that learners understand and like it.

During the last four decades, Kenya's secondary school students' Chemistry achievement has remained low (KNEC, 2005) necessitating several curriculum reviews. The first post-colonial Chemistry curriculum, developed soon after attaining independence in 1963, was teacher- and book-centred and therefore inappropriate because it neglected students' abilities, interests and potentials (Government of Kenya, 1976; Kamiti, 1984).

Later, curricular attempted to ensure appropriate teaching methods but were not implemented successfully for lack of qualified Chemistry teachers (Wachanga, 2002). They include the 1970 School Science Project (SSP) and the 1973 Kenya National Examinations Council Chemistry Syllabus (1973). With the introduction of the 8.4.4 education system in 1985, the study of Chemistry became compulsory in Form 1-2 but now many schools offer it from Forms 1-4. The Chemistry syllabus encouraged small group teaching and teaching through experiments and project. Although curriculum developers wanted Chemistry taught through these learner-based approaches, its teaching in secondary schools remained largely expository (Kiboss, 2001; Mullei, 1987). The class experiment teaching method involved supervised learning activities with students doing practical work individually or in groups (Das, 1985) while the Co-operative Class Experiment teaching method (CCE) incorporates co-operative learning into class experiments.

Slavin (1990) cautions teachers who believe students can simply be placed in groups, given interesting materials or problems to solve and allowed to discover information or develop skills. Successful cooperative learning should always include direct instruction because cooperative activities supplement, but do not replace, direct instructions. However, they involve individual accountability because group success depends on member's contribution to a team task.

During the past 15 years, there has been increasing international concern about effective integration of women into science and technology. Numerous international conferences have touched on gender and science and technology with many governments publicly acknowledging that effective development depends on the full utilization of all existing human resources. As such, there is need to ensure that woman's capabilities and strengths are recognized and put into full use. Again, without a receptive attitude towards instructional content, learners will have difficulties in acquiring the knowledge and understanding in the cognitive domain, that content retention is to a large extent dependent on the attitude that a learner brings to the instructional situation and cannot be over emphasized (Erickson & Erickson, 1984).

Anderson, Brown and Race (1998) in their findings state that "Learning requires active involvement of the students in constructing meaning rather than receiving more information." The learner must negotiate meaning with his or her learning community, make connections with past understanding, and modify these prior conceptions if they are not accurate and built understanding that are part of that person's personal conceptual framework. These new understandings occur in a learning community. Attending to context is an important consideration in fostering learning in science. Anderson et al. (1998) further elaborate that learning is dependent upon prior conceptions that the learner brings to the experience. The learner must construct

his/own learning. Learning is dependent upon shared understandings that learners negotiate with others, thus it is imperative to find out what the learners feel about Chemistry as a subject.

Research has shown that learners view utility of the subject (Chemistry) in both their current lives differently. Fennema and Sherman (1977) have found out that high school learners who achieve higher levels on Science tests perceive Sciences as being more useful than their lower achieving colleagues. Learners' perception of Math and Sciences-related careers emerges as significant predictor of both Mathematics and Science achievement and of Mathematics and Science related courses (Fennema & Sherman, 1977).

1.1 Statement of the Problem

Despite the efforts made by researchers to improve secondary school Chemistry curriculum, recent findings indicate that the level of Chemistry achievement, among other subjects, has remained persistently low (Ministry of Education [MOE, 2005]). Researchers have identified many variables affecting student achievement, especially girls. These include student's social-economic status, availability of learning resources, cultural context, family size, vocabulary of scientific terms and computation.

There seem to be limited research on the effect of attitude and gender on student performance in Chemistry. The study therefore endeavoured to fill the gap by investigating the attitude that students have towards Chemistry and its influence on academic achievement. This paper focuses specifically on the role of teacher-related factors in shaping those attitudes. Many students in Kenya choose to drop science subjects when given a choice and even those who take them; performance is below average (Changeiywo, 2000; Aduda, 2003).

Research findings and records from KNEC show that the mean scores in Biology and Physics lie between 27 and 32%, while that Chemistry lies between 25 and 26%. The overall performance is below average, worst of all is Chemistry. This difference in performance may be a result of the attitudes held by students towards Chemistry. Perhaps the poor performance in science subjects is the one that prompted the government through the Ministry of Education Science and Technology (MOEST), with the assistance of the government of Japan through Japan International Cooperation Agency (JICA), to undertake a programme to Strengthen Mathematics and Sciences in Secondary School Education (SMASSE) (Changeiywo, 2000). This programme has been implemented in Bureti District but students' performance in science still remains low (KNEC, 2005).

In response to the challenge posed by the poor performance and low enrolment in science, several studies have been carried out in Kenya to investigate the possible causes (Eshiwani, 1984; Kyalo, 1984; Mondoh, 1986; Wachanga, 2005). The majority of the studies centred on the instructional methods used by the teachers in teaching sciences and Mathematics. However, Haimowitz (1989) notes that the cause of most failures in schools might not be due to inadequate instruction but perhaps by active resistance by learners. Head (1988) reinforces this argument by pointing out that students do not like sciences in most cases and therefore it is imperative that their feelings are considered alongside their thought.

Mwamwenda (1995) also argues that the achievement of students in a subject is determined by their attitudes towards the subject rather than the inability to study. All these arguments point to the important role that attitudes play in determining the achievement of any success. This therefore suggests that favourable attitudes towards sciences should be developed if success is to be attained. To be able to do this, a clear understanding of factors which influence formation of attitudes is essential. This paper therefore examines the relationship between the attitudes held by learners towards Chemistry and teacher-related factors.

1.2 Limitations of the Study

Although the descriptive survey design employed in the study enabled data collection on many variables, there were increased chances of sampling errors. Despite the fact that the design allowed for a large number of subjects, the number used was small since more subjects could attract increased costs. The few boys' schools in the District and the proportionate sampling technique may not have provided a truly representative sample and since the design was non-experimental, independent variables might not have been fully controlled.

2 MATERIALS AND METHODS

The study was conducted in Bureti District in South Rift Valley Province. Thirty percent of the Secondary schools in the District are provincial schools while the rest are district secondary schools. The District has a total of 55 secondary schools of which 40 are co-educational, eleven are girl's schools, and four are boys' schools. The main concern of the author was the academic performance of students in the Kenya Certificate of Secondary Education (KCSE) national examination. Bureti District has continued to pose poor results in chemistry in National examinations.

The study sought to obtain information on students' attitudes towards Chemistry through questionnaires. As such, descriptive survey method was chosen because it is suited to the study of individual's attitudes. The study population comprised 189 Form Four students in public secondary schools and 10 Chemistry teachers in ten Secondary schools within Bureti District of Rift Valley Province, Kenya. A Chemistry teacher of the selected schools was part of the study because they have a task of preparing and creating a proper teaching and learning environment. Form Four students were selected because they have been in the school long enough to exhibit the necessary affective variables. The experience they have gained could enable them think abstractly.

Since it was practically impossible for the author to access all the schools in the District, only accessible population of secondary schools was used. The use of different types of schools was adopted so as to provide a representative sample of the school population from Bureti District. Stratified random sampling was used to get students from different settings. This was because there are claims that students in these different settings perform differently in academic work. In the study, the sample size comprised 10 Secondary schools, 10 Chemistry teachers and 189 students. The total number of respondents was 199.

Data was broken into broad categories for analytical purposes (parametric and non-parametric). It was then prepared for analysis through coding. Editing and cleaning of the data collected preceded analysis. Data was analyzed using descriptive statistics, which included use of frequency tables, means, standard deviation and percentages, while hypotheses were tested using analysis of variance.

3 RESULTS AND DISCUSSION

3.1 Teaching Methods Used By Chemistry Teachers

The author intended to find out whether students were comfortable with teaching methods used by Chemistry teachers.

<i>Whether comfortable or not</i>	<i>Frequency</i>	<i>Percentage</i>
Yes	112	60
No	77	40
Total	189	100

Table 1. Teaching Methods Used By Chemistry Teachers

Table 1 indicated that 112 students (60%) were comfortable with the teaching methods while 77 students (40%) were uncomfortable. This seems to imply that more than half of the students sampled were comfortable with the teaching methods used by their Chemistry teachers and were likely to develop positive attitude towards the subject. Some of them blamed their teachers for being non-accommodative to them as slow learners, unapproachable and threatening. One student said, "Our Chemistry teacher threatens us with punishment when we tell him that we do not understand his methods".

Though teachers with high morale, motivation and mastery of knowledge, learner difficulties and capacity to facilitate learning are important (Zadra, 2000), correct use of an appropriate teaching method is critical to the successful teaching and learning of Chemistry. Students may learn names and definitions of chemical substances theoretically, but to master chemical reactions, they need to mix the chemicals and observe subsequent reactions. Knowledge of how teaching methods affects students learning may help educators to select methods that improve teaching quality, effectiveness and accountability to learners and the public. This is supported by Cole (1989) who gives the findings of a study where teachers reinforced negative attitudes

towards their learners by the materials and methods they used to teach their students their subjects. In another study, Singh (1994) gives results of a study in which teacher attitudes were demonstrated. According to him, teachers need to be aware of the values they are transmitting through their lessons and the attitudes, which are being cultivated in every aspect of school life.

3.2 Chemistry Teacher not being available for Consultation

Teachers need to bear in mind that students' effective learning depends on them; they should show interest in their work. The study therefore sought to establish whether or not teachers were available for help when needed outside normal classes.

<i>Response</i>	<i>Frequency</i>	<i>Percentage</i>
Agree	143	75
Disagree	38	21
Undecided	8	4
Total	189	100

Table 2. Chemistry teacher is available for extra help

Majority of the students (75%) revealed that their Chemistry teacher is available for extra help outside normal class hours as shown in Table 2. They expressed that they liked the subject because of their teacher. Such teachers were described as helpful. These teachers gave exercises with examples and related subject matter to everyday life. Since teacher attributes were said to have enhanced the students' liking the subject, teachers are therefore a factor in influencing students' attitudes towards the subject. Eight students (4%) were undecided while 38 students (21%) revealed that their Chemistry teacher is not available for extra help outside normal class hours. This could mean that their teachers went home immediately after classes or were just reluctant to teach overtime.

One student puts it this way: "...our teacher has no interest in me as a learner. He considers my questions silly..." However, the teachers could be having heavy teaching loads and big overcrowded classes, which prevented them from giving extra lessons or individual help to those in need. It could therefore mean that teacher's attitudes affect the learner's achievement in the subject.

A teacher who is interested and enthusiastic to help all his/her learners is likely to inculcate positive attitudes towards the subject. Women Chemistry teachers offered poor models to some students in the study. They did not want to be taught by a woman teacher. One girl expressed her opinion as follows: "Women teachers in my experience tend to be moody, when you ask a question they get annoyed". The revelation of this result where girls have reservations about being taught by female teachers needs further research. Whilst it is true that a teacher's behaviour may be responsible for the development of negative attitudes towards Chemistry in students, it is also true that such attitudes may result automatically from doing badly in the subject. Students at times blame their teachers for their failure even if the teachers have been hardworking and helpful to them. The relationship between attitudes and performance is certainly the consequence of a reciprocal influence in that, attitudes affect achievement and achievement in turn affects attitudes (Ajzen, 1970).

Students must be helped to see the usefulness of Chemistry as applied to daily living. The social context of problems must be exploited rather than teaching it as an abstract and a subject that is unrelated to life. One of the girls put it this way: "Our teacher is mostly in a hurry, we don't understand when he is teaching.... they should be linking it to everyday life, that's why it is difficult". The current trend in science requires the teacher to link what is learnt in class with real life situations so that the learners can appreciate the subject. This is supported by Jegede (2003), that the study of Chemistry, among other things, would enable the student to know the link between Chemistry and industry, the environment and everyday life in terms of benefits and hazards.

3.3 Effective Use of Teaching and Learning Resources in Chemistry

The study also sought to know from the teachers whether or not the teaching and learning resources and references were effectively being made use of in Chemistry.

<i>Response</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Reference books frequently used</i>	8	80
<i>Practical work frequently done</i>	2	20
<i>Total</i>	10	100

Table 3. Extent to which teaching and Learning Resources in Chemistry are effectively being made use of

It is shown in Table 3 that most teachers, 8(80%), revealed that the extent to which teaching and learning resources are being made use of was good while 2 teachers (20%) revealed that practical work is being done fairly. This implies that most schools have teaching and learning resources, which are being used effectively, thus the performance in Chemistry is expected to be good.

The instructional materials such as textbooks, chemicals for laboratories and other physical facilities have been identified by some researchers as important in students' performance. Bogonko (1992) and King and Hill (1993) have all observed that some schools lack the necessary facilities and instructional materials, which could enhance the students learning. However, Kenya has done well to train many teachers but the issue of physical facilities and instructional materials has to be solved in some schools. Muya (2000) blames the head teachers for lack of facilities in the schools. He sees it as lack of priorities because some of the schools visited by the Ministry of Education officials had big buses, beautiful gates but the laboratories are poorly equipped. The observation made by KNEC is that lack of teaching materials affects student's performance in national examinations.

3.4 Teachers' Personal Level of Knowledge and Skills in Chemistry Subject Matter

Ability to teach could also be a result of the teacher having command of knowledge of subject matter at least. The study, therefore, sought to establish the teacher's personal level of knowledge in Chemistry.

<i>Response</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Fair</i>	2	20
<i>Good</i>	5	50
<i>Excellent</i>	3	30
<i>Total</i>	10	100

Table 4. Teacher's personal level of knowledge in chemistry

It is noted from Table 4 that 2 teachers (20%) revealed that their personal level of knowledge and skills in Chemistry is fair, while 5 teachers (50%) said that their personal level of knowledge and skill in Chemistry subject matter is good and 3 teachers (30%) revealed that they had excellent personal level of knowledge and skills in Chemistry subject matter. It is clearly shown that more than half of the teachers were competent in the subject they taught. 80% of the teachers in the study had a degree in Education Science. It should be mentioned that a teacher could only improve on his/her competence in teaching by reading widely about the subject matter.

Educational thinkers are focused on helping teachers to be productive and effective in their teaching. Bandura (1977) urges that for a teacher to be effective, he/she should be able to explain complex ideas and processes with patience. As he conducts his/her explanations, he should speak slowly, patiently, clearly, vary his speech to avoid monotony. Teachers' personal morale and motivation in teaching Chemistry is essential. A Chemistry teacher is expected to like his/her profession. He/she should be encouraged to read widely for self-improvement and avoid stagnation. The teacher should be enthusiastic about what he/she teaches because this has an effect on teaching.

3.5 Teacher's Ineffectiveness as a Result from Student's Negative Attitudes

Teachers' ineffectiveness in teaching Chemistry might not always be their fault but could also result from unfavourable teaching conditions as well as students negative attitudes. The research, therefore, sought to find out from the teachers as shown below.

<i>Response</i>	<i>Frequency</i>	<i>Percentage</i>
Disagree	2	20
Undecided	1	10
Agree	5	50
Strongly agree	2	20
Total	10	100

Table 5. Teacher's ineffectiveness could result from students' attitudes

Most teachers (70%) in the study revealed that teachers' effectiveness is contributed by students' negative attitudes. One teacher (10%) was undecided while 2 teachers (20%) said that students' negative attitude is not a factor in teachers' ineffectiveness as shown in Table 5.

The 7 teachers (70%) could argue that lack of interest in the subject by the students might have been instilled by their poor background; it would therefore be difficult to convince those who had developed negative attitudes that they could achieve good grades if they worked harder. Thus pupil's lack of enthusiasm to learn Chemistry could reduce teachers' interest to help them. This supports the findings by Busari (1991) that established a positive relationship between teachers' quality of teaching and interest of students in science subjects. It was confirmed that some students could not manage to work out problems they considered difficult without the assistance of the teacher.

4 CONCLUSION AND RECOMMENDATIONS

From the study findings presented above, it is clear that teaching in some cases contributes to students having negative attitudes and that most students did not prefer to be taught by female teachers. Teachers' teaching styles and personality could either inspire or hamper students' progress. Thus teachers and schools have a role to play, but on their own cannot be expected to transform the attitudes and behaviour of students, since many students start school with set of cultural values.

However, looking closely at what might instil such behaviours in students, it is evident that this could be blamed on teachers as well as unfavourable learning conditions in school. Some teachers are good at teaching but fail to work effectively because of the unfavourable conditions of the school. On the other hand, some teachers are the cause for concern because they are ineffective as individuals. The schools' administration may also be blamed for some conditions in schools.

It is recommended that teachers should improve their teaching methods. Chemistry should be taught in a practical way through demonstrating its relevance to all aspects of life. Teachers must be gender sensitive. They should counsel girls and generally should spend more time with the slow learners. More in-service programmes for teachers in the field should also be mounted. Teachers in training institutions should also be sensitized about gender issues before they join the service. Lastly, teachers should provide individual attention and frequent feed-back to students as need arises. The teachers must always ensure they are available for consultation by students.

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