Influence of Community Indigenous Knowledge of Science on Students' Performance in Chemistry in Secondary Schools of Samburu County, Kenya

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ABSTRACT

The purpose of this study was to assess the influence of Community Indigenous Knowledge of Science on Students' Performance in Chemistry in secondary schools of Samburu County. Cross-Sectional study design under the descriptive survey research was used. A stratified random sample of 9 secondary schools including both the public and private was drawn. From the target population of 752 form three students of Samburu County in the year 2013, stratified and simple random sampling was used to select a sample of 224 students. The instruments were validated and pilot tested before use. The reliability coefficient for Chemistry Performance Test (CPT), Students' Questionnaire (SQ) and Students' Interview Schedule (SIS) was 0.80, 0.68 and 0.72 respectively. The instruments were scored and data was analyzed using descriptive statistics where means, percentages and frequencies were used to analyze the data. Pearson's Correlation Coefficient was used to establish the relationships between the different variables in the study. All statistics of test of significance were conducted at significance level of alpha (α) equal to 0.05 with the help of the computer program, statistical package for social sciences (SPSS). The results of the study showed that students' performance in chemistry was below average whereby boys' schools performed better than both the girls' and co-educational schools. There was no statistically significant relationship between Community Indigenous Knowledge and Students' Performance in Chemistry. Community Indigenous Knowledge of Chemistry and its application in treatment of diseases promote students' understanding of chemistry. The researcher recommended that the Ministry of Education should initiate in-service courses for science teachers to equip themselves with the skills of Community Indigenous Knowledge of Science to enhance their effectiveness in teaching of science subjects. The findings of this study are of great benefit to teachers, curriculum developers and policy makers in addressing the current poor performance of chemistry and realization of strategies for boosting performance of chemistry in secondary schools countrywide.

Keywords: Community indigenous knowledge, science, students' performance, chemistry

INTRODUCTION

Education is an integral part of life in any society. The social and cultural forces surrounding each individual thus form the basis of indigenous education. Hinzen (1988) observes that during the long ages of pre-history, human beings survived because they were capable of learning by example and experience to adapt their way of life to their environment throughout succeeding generations. Indigenous education in its various forms is intimately intertwined with social life. Sifuna (1990) emphasizes that what was taught in traditional societies was related to social context in which people lived as well as the demands of their particular

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environment. Thus, indigenous knowledge had a direct and symbiotic relationship with the environment (Castle, 1966 & Ocitti, 1973). Indigenous Knowledge also responded to social change and was an important catalyst of change. Indigenous knowledge was therefore associated with social development.

Indigenous knowledge takes many forms, depending on the particular historical and cultural background. According to Ishumi (1976), this education is influenced by the prevailing economic, social, religious and political systems. In short, this system of education sustains community development. In support of this, former President of Tanzania, Mwalimu Julius Nyerere, described indigenous education as an integral part of life (Hino, 1996).

Africa has a relatively rich body of indigenous knowledge and related technologies. This is embodied in the continent's cultural and ecological diversities and has been used by the African people for thousands of years to solve specific developmental problems (Ogunleye, 2009). Indigenous knowledge and technologies play major roles in biodiversity conservation, sustainable use and prospecting. In addition, their contributions to increasing food production, fighting HIV/AIDS and other diseases, and stemming environmental degradation are considerable (Hills, 1989). Despite their contributions, indigenous knowledge and technologies are not adequately promoted and protected in most African countries (Turnbull, 2000). Institutions to safeguard the rights of indigenous knowledge holders are weak in most countries. In addition, there are weak links between the formal institutions and the local communities that hold and use the knowledge. This has denied Africa the opportunity to better understand and use its indigenous knowledge base hence having a wider gap between IK and Western Science (Hills, 1989 & Ogunleye, 2009).

African leaders have recognized and stressed the importance of protecting and promoting indigenous knowledge and technologies to solve their specific problems and improve the continent's economies. NEPAD framework document are devoted to the protection and promotion of indigenous and related technological innovations (Turnbull, 2000). Paragraph 140 states: "Culture is an integral part of development efforts of the continent. Consequently, it is essential to protect and effectively utilize indigenous knowledge …and share this knowledge for the benefit of humankind…special attention (will be given to) the protection and nurturing of indigenous knowledge …inventions, …and all other tradition- based innovations and creations"(Turnbull, 2000). Indigenous knowledge has been used in treatment of various diseases using herbs for example the Chinese Wormwood (*Artemesia annua*) for treating malaria and Prunus Africana bark used for treating cancer (Turnbull, 2000).

Culture has received considerable attention in the global world with its varying definitions. The assumptions that culture is the primary determinant of academic achievement can be dangerous and counterproductive if misinterpreted (Hills, 1989 & Ogunleye, 2009). Culture depicts people's peculiar patterns of values, attitudes, knowledge, skills, behaviors, language and technology (Akinwale, 2004). It is the sum total of the learned behavior of a group of people that are generally considered as their tradition and are transmitted from generation to generation and in various forms (Ogunleye, 2009). Cultural differences and characteristics manifest themselves in different domains and at different depth. Applying UNESCO's general definition, domains of culture include spiritual, material, intellectual and emotional features of society or group, in addition to its art and literature, lifestyles, way of living together, value system, traditions and beliefs (Akinwale, 2004).

Chemistry teaching can only be result-oriented when students are willing and the teachers are favorably disposed, seeing the appropriate methods and resources in teaching the students.

With the current increase in scientific knowledge in the world all over, much demand is placed, and emphasis is laid on the teacher, the learner, the curriculum and the environment in the whole process of teaching and learning of science (Emovon, 1985). Despite the importance of Chemistry to mankind and the varied efforts of researchers to improve on its teaching and learning, the achievement of students in the subject remains low in Nigeria and other African countries including Kenya. Among the factors that have been identified outcomes in chemistry are, poor methods of instruction (Osuafor, 1999), teacher's attitude (Aghadiuno, 1992), laboratory in-adequacy (Okegbile, 1996; Raimi, 1998; Bajah, 1999 & Adeyegbe, 2005) and poor science background (Oshokoya, 1998 & Adesoji, 1999).

Positive perception of Science by students plays a major role in advancement of modern technology of any country in the world. America, Britain, Japan and China have excelled well in the field of Industrialization because of being well established with scientific skills. Kenya envision being a middle income country by the year 2030, however looking at the performance of science subjects at Secondary education level, achievement of the vision may be in doubt because of the negative perception of Mathematics and sciences leading to lower performance by students at Kenya Certificate of Secondary education (SMASSE project, 1998). Many students in Kenya choose to drop science subjects when given a choice and even for those who take them, the performance is below average (Changeiywo, 2000 & Aduda, 2003), the poor performance is evident from results in Table 1, which compares the students' performance in Chemistry and other science subjects and the situation is similar to that one in Samburu County.

Table 1. Comparison of Students' Performance in KCSE Chemistry and other Science subjects

Subject	*2008*		*2009*		*2010*		*2011*		*Average*
	Cand	*Mean (%)*	*Cand*	*Mean (%)*	*Cand*	*Mean (%)*	*Cand*	*Mean (%)*	*Mean (%)*
Bio	203,936	25.95	217,928	27.42	245,911	40.64	270,894	47.25	35.32
Phy	63,562	37.21	72,499	39.95	83,273	39.95	94,318	43.21	40.25
Chem	213,499	24.31	236,901	24.79	266,761	25.17	298,761	25.58	24.96

Source: (Kenya National Examination Council report, 2012: ii-iii).

Table 1: Shows that the average mean scores in Biology and Physics lie between 35-40% while the average mean score in Chemistry is 24%. This difference in performance may be as a result of the negative influence of community Indigenous knowledge of science held by students towards science subjects. Improving the performance of science education is a great societal challenge in Kenya not only for industrialization of the country but also for producing scientifically empowered citizens with adequate scientific skills. This poor performance is the one that prompted the government of Kenya through the Ministry of Education Science and Technology (MOEST), with assistance of the Japan through Japan International Corporation Agency (JICA) to initiate a programme on the Strengthening of Mathematics and Science in Secondary Education (SMASSE) (Changeiywo,2000).This programme has been implemented in Samburu County but students' performance in these subjects especially Chemistry among the Sciences continued being below average in spite of this intervention (KNEC report, 2012), as shown in Table 2.

Table 2. Samburu County Students' Performance in 2010 to 2012 KCSE Examinations in Mathematics and Sciences

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Subject	2010				2011				2012			
	Female		Male		Female		Female		Male		Female	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
Math	159	20.09	314	25.8	211	24.5	358	28.13	251	21.43	374	27.93
Biology	7	41.02	314	43.3	211	54.5	358	57.83	251	53.43	374	55.21
Physics	159	40.12	88	43.5	20	41.39	87	44.93	17	37.92	87	45.13
Chem	159	31.09	314	32.6	211	32.93	358	34.52	251	31.14	374	33.91

Source: (Samburu County D.E.O's office, 2012: iv-v)

In response to the challenges posed by the influence of Indigenous knowledge of science on students' performance and low enrolment in science subjects, several studies have been carried out in Kenya to investigate the possible causes, (Eshiwani, 1974, Mondoh, 1986 & Wachanga, 2002). Majority of the previous studies centered on the instructional methods used by teachers, however, Haimowitz (1989), noted that the causes of most failures in schools might not be due to insufficient or inadequate instructions but perhaps by active resistance of the learners. Also, the research findings from baseline studies by "SMASSE" project (1999), has shown that consistent failure in Mathematics and Sciences at KCSE and negative attitude by students towards Mathematics and Sciences continues to characterize the classroom. This trend is posing huge problems to parents, government, politicians and stakeholders in education.

This therefore suggests that favorable means of improving Mathematics and Science subjects' performance in secondary level Education should be developed if success is to be attained. To be able to do this, clear understanding of the influence of community Indigenous knowledge of Science on students' performance in Chemistry is essential. However, this is not clear among students in Samburu County. This study attempts to investigate on the influence of Community Indigenous knowledge of Science on students' performance in Chemistry in Secondary Schools of Samburu County.

STUDY OBJECTIVES

The study was guided by the following objectives:

1. To determine the influence of community indigenous knowledge on students' performance in chemistry in secondary schools of Samburu County.
2. To find out the influence of community indigenous knowledge of students' beliefs in cultural interpretations of scientific phenomena on students' performance in chemistry.
3. To investigate the influence of community indigenous knowledge of chemistry on students' performance in chemistry.
4. To find out the influence of community indigenous knowledge application in treatment of diseases on students' performance in chemistry.
5. To determine the influence of attitude towards community indigenous knowledge of science on students' performance in chemistry.

CONCEPTUAL FRAMEWORK

The conceptual framework used in this study was based on the general systems theory presented by Buckley (1967) and cultural ecology theory by Nanda (1980) mentioned in section 2.7. To successfully adapt Buckley's and Nanda's General system theory and cultural ecology theory respectively, the conceptual model representation illustrated in figure 1, was used to guide the study.

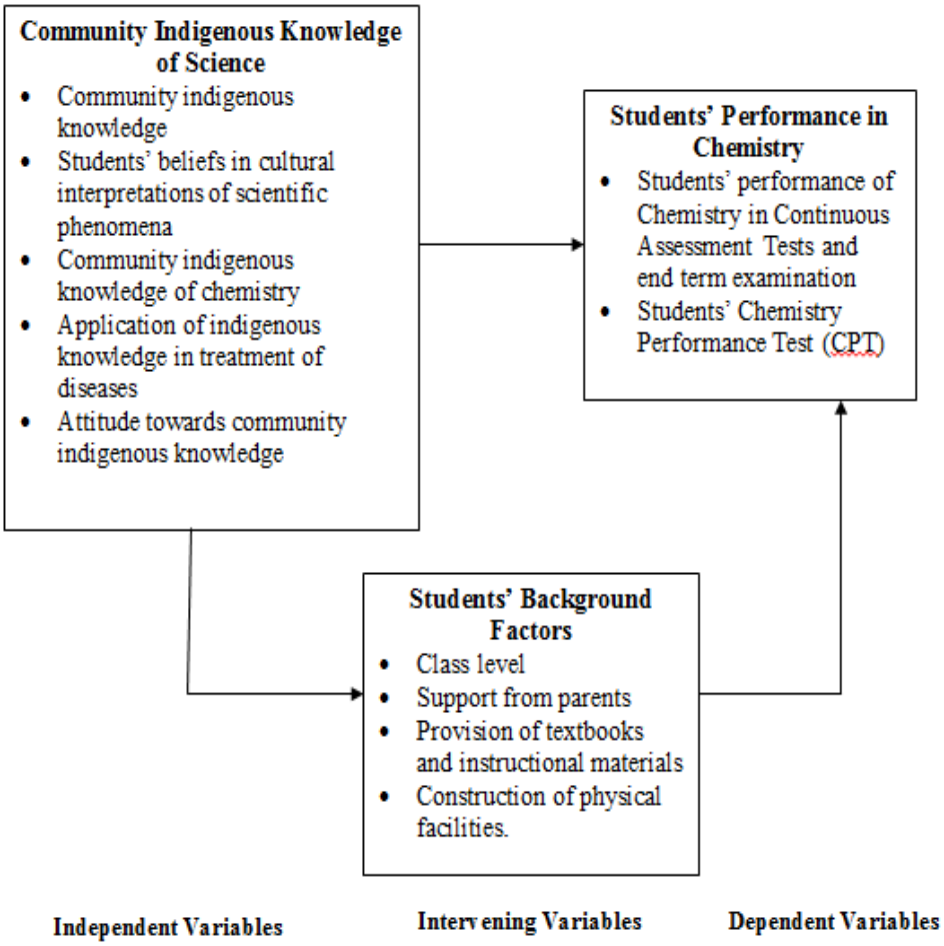

Figure 1. Conceptual framework for determining the influence of Community Indigenous Knowledge of Science on Students' Performance in Chemistry

Figure 1 illustrates the conceptual framework that relates the various factors considered to have an influence on students' performance in chemistry. The extraneous or intervening variables in this study were class level of students, support from parents, provision of text books/teaching aids and construction of physical facilities. These were controlled as follows: Students' class level was controlled by involving form three students who had comparable language in understanding of chemistry concepts. Support from parents was controlled by involving students who did not miss classes because of indiscipline cases or being out of school because of lacking school fees or even text books for use in school. The schools with adequate physical facilities including equipped libraries and laboratories were used. In this study, community indigenous knowledge was the independent variables and the students' performance in chemistry was the dependent variables. Students' background factors in this study were the extraneous or intervening variables.

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RESEARCH METHODOLOGY

The study was a Descriptive Survey research in nature, with specific use of Cross-Sectional study design. Moser and Kalton, (1993) stated that the value of Surveys has been established beyond all questions and in widely different fields. Brunt, (1997) affirmed that systematic sample surveys can give very accurate measurements of a population's characteristics and attributes. Cross-sectional study design was relevant in this study for it would provide a way of obtaining facts and about opinions of individuals who would avail representative information about a larger population. In this way Cross-Sectional studies provide a 'snapshot' of the outcome and the characteristics associated with it, at a specific point in time (Kasomo, 2007). In the present study, the researcher proposes to determine the influence of community indigenous knowledge of science on students' performance in chemistry. The independent variable in this study was community indigenous knowledge of science while students' performance in chemistry was the dependent variable. Community indigenous knowledge of science was studied Vis-a-Vis its' influence on students' performance in chemistry. The study therefore would give an analysis of existing state of events, hence a Cross-Sectional Study design being chosen because of the nature of the subject of inquiry in this study.

Sampling Procedures and Sample Size

There were 752, form three students, 2013 in Samburu County. There were 302 girls and 450 boys who translate to 40 (%) percent and 60 (%) percent respectively of the total 2013 pre-candidates population in the County (DEO Report, 2013). Simple random sampling was used in selecting boys and girls in single sex schools because it gives each unit in the population an equal opportunity to be included in the sample (Kathuri & Pals, 1993). Nkapa (1997) argues that, there is no first hand rule for obtaining sample size. However, in this study the expression, $n = \frac{Z^2PqN}{(N-1)\,e^2 + z^2Pq}$ was used in determining the sample size (n) as

with Kothari (2003) method of sample size determination from a finite population as shown in appendix IV. Using this expression, a sample size of 224 was arrived at taking proportionate sample means that, 90 girls and 134 boys were selected for this study from a total sample of nine secondary schools. Therefore the minimum number of girls that were selected per school was 15, while on other hand the minimum number of boys was 22. The total sample size was selected as shown in Table 3, for equal distribution of responses among the respondents.

Table 3. Selection of the Sample Size per School Type

School Type	*Total No. of Schools*	*Total No. of Girls*	*Total No. of Boys*	*Total*
Girls' Schools	3	72	-	72
Boys' Schools	3	-	91	91
Co-Educational	3	18	43	61
Total	9	90	134	224

Source: Samburu County D.E. Office, 2013: p, 9-12

From the total sample of 224 in Table 3, 50 students were proportionately sampled from the sample for the interview schedules. Taking a proportionate sample means that, 30 boys and

20 girls would be selected from the sample schools. A minimum number of girls that was selected per school were 3 and 5 for boys.

Stratified and simple random sampling was used to ensure that each category of Schools was equitably selected for the study. Using stratified sampling technique each of the six divisions of the County was grouped in to two strata, such that schools in every division form a separate stratum. Because of the homogeneity of the schools across divisions, smaller size divisions with one or two schools were merged with large divisions with many schools falling on the same side of the County, hence having two major divisions that are Kirisia and Leroki. For the purpose of sampling, the distribution of schools in each of the two major divisions was based on the type of school category as shown in Table 4.

Table 4. Selection of School Categories for Sample Size

School Type	*Division*		*Total*
	Leroki	*Kirisia*	
Boys	1	2	3
Girls	2	1	3
Co-educational	1	2	3
Total	4	5	9

Source: Field Data

The advantage of stratified sampling is that, it ensures the inclusion into the sample, sub-groups which otherwise would be omitted entirely by other sampling methods because of their small number in population (Gall, 1989; Mugenda & Mugenda, 1999). In this case, stratified sampling would ensure that all the schools from the six divisions were given a chance to be included in the sample. To ensure that all parts of the County were represented, equal number of schools from each school type was selected randomly from each of the two divisions since most of the schools in Samburu County had one stream.

Data Collection and Analysis

Before proceeding to conduct the study, the researcher obtained an introductory letter from Egerton University board of postgraduate studies. This would facilitate the issuance of a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) authorizing the researcher to carry out the research in public and private secondary schools in Samburu County. The County Director of Education and the head teachers of the sample schools in the Samburu County were informed of the purpose, scope and time frame of the study. The chemistry performance test, questionnaires and interview schedule were self- administered where students were asked to complete the same and also attend to the interview schedule. For accuracy and consistence of information, students were given thirty minutes to answer the questions in test items, fill in the questionnaires and later on attend to interview schedule. Students were assured of confidentiality by the researcher who would then collect the chemistry performance test items and questionnaires from students the same day after they had been filled.

The researcher scored the Chemistry Performance Test, Students' Questionnaire and the Interview Schedule so as to generate both the quantitative and qualitative data respectively.

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Data was analyzed using the computer program, Statistical Package for Social Sciences (SPSS) version 17.0 for windows. Descriptive Statistics was used where means, percentages and frequencies were determined. Pearson's Correlation Coefficient (r) was used to establish relationships between the Independent and Dependent variables in the study. Pearson's correlation coefficient is used where both data is in interval scale (Black, 2002). The cause and effect relationship between factors affecting the values in question would not be assumed. Consequently, the correlation coefficient was used to indicate the strength and direction of the relationship between scores of variables. To make reliable inferences from the data, the correlation was subjected to tests of significance at alpha ($\propto$) equal to 0.05.

RESULTS AND DISCUSSIONS

Results

Results on Students' Chemistry Performance Test (CPT)

Chemistry Performance Test (CPT) items were used to collect data on students' performance in chemistry. A total of 224 students sat for the Test items. Data was collected, analyzed and presented in tabula form using figures. Chemistry Performance Test (CPT) was administered to the sample schools in both Kirisia and Leroki divisions of Samburu County and results are summarized in Table 5.

Table 5. Students' Performance in Chemistry per Division (N = 224)

Division	*Number of Respondents (N)*	*Mean*
Kirisia	153	34.992
Leroki	71	34.377
Total	224	34.795

Source: Field Data

Results of Table 5; shows that Kirisia division was on the lead with a mean of 34.992 while Leroki becoming second with a mean of 34.377 and this could be attributed to having adequate teaching/learning resources in Kirisia division than in Leroki. In sample schools, both boys and girls were involved in the study. The results for Chemistry Performance Test (CPT) administered and scores scored by the different gender of students are presented in Table 6.

Table 6. Chemistry Performance Test Scores Scored by the different Gender of Students (N = 224)

Division	*Number of Respondents (N)*	*Mean*
Female	90	30.985
Male	134	36.902
Total	224	34.548

Source: Field Data

Results in Table 6 indicate that male students performed better than the female students as indicated by the means in the table above. This could be attributed to the general notion that sciences are for males and not for females.

Influence of Community Indigenous Knowledge on Students' Performance in Chemistry

Chemistry Performance Test (CPT) scores of students and total attitude scores obtained using Students' Questionnaires were used in computing the correlation between Community Indigenous Knowledge and Students' Performance in Chemistry. Table 7 presents this information.

Table 7. Correlation between Community Indigenous Knowledge and Students' Performance in Chemistry (N = 174)

CPT Marks	*Total Attitude Score*	*Pearson's correlation co-efficient (r)*	*P value (Sig. 2- tailed)*
6.5	608	0.283	0.587
20.5	311		
34.5	685		
48.5	617		
62.5	653		
76.5	559		

The correlation is not significant at 0.05 level (2-tailed).
r- Critical = 0.811, p > 0.05.
Source: Field Data

Table 7 shows the correlation results between Community Indigenous Knowledge and Students' performance in Chemistry of question one of the study. Question one of the study sought to find out whether the Community Indigenous Knowledge has influence on students' performance in Chemistry. Results in Table 7 revealed a negative correlation between Community Indigenous Knowledge and Students' performance in Chemistry, at alpha (α) equal to 0.05 (r = 0.283, N = 174, P > 0.05). This means that Community Indigenous Knowledge has a negative influence on students' performance in science subjects especially in Chemistry. This was attributed to Community Indigenous Knowledge and practices having less practical skills required in learning of sciences and hence not forming the basic foundation in understanding of scientific concepts. Although r-calculated was less than r-critical (r- calc. < r- crit.), there was no direct significant correlation between the variables.

Influence of Community Indigenous Knowledge of Students beliefs in Cultural Interpretations of Scientific Phenomena on Students' Performance in Chemistry

Chemistry Performance Test (CPT) scores of students and total attitude scores obtained from Students' Questionnaires were used in computing the correlation between Community Indigenous Knowledge of Students' beliefs in Cultural interpretations of Scientific Phenomena and Students' Performance in Chemistry. Table 8 presents a summary of this information.

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Table 8. Correlation between Community Indigenous Knowledge of Students' beliefs in Cultural Interpretations of Scientific Phenomena and Students' Performance in Chemistry (N = 174)

CPT Marks	*Total Attitude Score*	*Pearson's correlation co-efficient (r)*	*P value (Sig. 2- tailed)*
6.5	603	- 0.366	0.476
20.5	614		
34.5	398		
48.5	417		
62.5	457		
76.5	562		

The correlation is not Significant at 0.05 level (2-tailed)
r- Critical = 0.811, $p > 0.05$
Source: Field Data

Table 8 shows the correlation results between Community Indigenous Knowledge of Students' beliefs in Cultural Interpretations of Scientific phenomena and Students' performance in Chemistry. Question two of the study sought to find out whether Community Indigenous Knowledge of students' beliefs in Cultural Interpretations of scientific phenomena has influence on students' performance in Chemistry. Result reveals that there was no significant correlation between the variables at alpha (α) equal to 0.05 ($r = - 0.366$, $N = 174$, $p > 0.05$). The correlation revealed that, students' beliefs in Cultural interpretations of scientific phenomena had a negative influence on their performance in Chemistry. This was attributed to students' not being able to interpret their beliefs in Cultural interpretations of scientific phenomena to modern science especially Chemistry. Since r-calculated was less than r-critical (r- calc. < r- crit.), there was inverse correlation in cultural beliefs with students' performance in chemistry.

Influence of Community Indigenous Knowledge of Chemistry on Students' Performance in Chemistry

Does Indigenous Knowledge of Chemistry help you in understanding of Chemistry concepts? Students' interview schedule was used to collect data on the influence of Community Indigenous Knowledge of Chemistry on students' performance in Chemistry. A total of 50 students were interviewed. Data was collected, analyzed and presented in tabular form using figures. The results for the students' interview schedule on the influence of Community Indigenous Knowledge of Chemistry on Students' Performance in Chemistry are summarized in Table 9.

Table 9. Influence of Community Indigenous Knowledge of Chemistry on Students' Performance in Chemistry (N = 50)

Response	*Frequency (f)*	*Number of Respondents (N)*	*Percentage (%)*
Yes	50	50	100
No	00	00	00
Total	50	50	100

Source: Field Data

Table 9 implies that all the respondents interviewed agreed that Indigenous Knowledge promotes understanding of Chemistry Concepts. This was clearly indicated by their positive responses on this area. The results for reasons to why Community Indigenous Knowledge promotes understanding of chemistry are summarized in Table 10.

Table 10. Reasons why Indigenous Knowledge Promotes Understanding of Chemistry (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Helps in understanding different states of matter and their chemical components	12	24
Develop critical thinking for learning science	13	26
Understanding of plants and their chemical components	13	26
Help develop scientific skills needed in understanding nature	13	26
Total	50	100

Source: Field Data

Table 10 shows that critical thinking for learning science, understanding plants and their chemical components and development of scientific skills needed in understanding nature are the major reasons as to why indigenous knowledge promotes understanding of Chemistry. Table 11 gives the summary on the importance of Community Indigenous Knowledge of Chemistry in herbal medicine.

Table 11. Importance of Indigenous Knowledge of Chemistry in Herbal Medicine (N = 50)

Importance	*Frequency (f)*	*Percentage (%)*
Understanding various parts of plants and their Medicinal values.	35	70
Classification of plants according to their Medicinal uses in treatment of Animal and plants Diseases.	15	30
Total	50	100

Source: Field Data

Results in Table 11 shows that, 70% of the respondents interviewed agreed that the importance of Indigenous Knowledge was to understand the various parts of plants and their Medicinal values while 30% accepted that Indigenous Knowledge was important in classification of plants according to their Medicinal values in the treatment of animal and plant diseases. Is there any Indigenous Knowledge of Chemistry in Witchcraft? The results for the presence of Indigenous Knowledge of Chemistry in witchcraft as revealed by the students' interview schedule are summarized in Table 12.

Table 12. Presence of Indigenous Knowledge of Chemistry in Witchcraft (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Yes	31	62
No	19	38
Total	50	100

Source: Field Data

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Most of the respondents in Table 12 agreed that Indigenous Knowledge of Chemistry was also applied in Witchcraft while a few denied that Witchcraft was not associated with Indigenous Knowledge of Chemistry. The results for reasons of having Indigenous Knowledge of Chemistry in witchcraft as revealed by the Students' Interview Schedule are presented in Table 13.

Table 13. Reasons for Indigenous Knowledge of Chemistry in Witchcraft (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Animal parts mixed with charms to harm	13	26
Plants parts and extracts used for harming other people	17	34
It does not stimulate critical thinking needed in science	16	32
Charms used to create wealth	04	08
Total	50	100

Source: Field Data

Results in Table 13 indicate that 34% of the respondents interviewed agreed that the use of plants extracts and parts was actually the chemistry that was applied to witchcraft in harming other people. While 32% disagreed arguing that it does not promote critical thinking needed in science. Table 14a gives the summary of the challenges encountered by students in understanding Chemistry concepts as revealed by the Students' Interview Schedule.

Table 14a. Challenges encountered by Students in Understanding Chemistry (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Chemistry language used by teachers and books' authors being difficult for learners to understand.	15	30
Poor peer Influence towards Chemistry.	06	12
Inadequate Chemistry practical skills.	11	22
Difficulties in understanding chemistry calculations.	13	26
Inadequate teaching and learning materials.	05	10
Total	50	100

Source: Field Data

Results in table 14a; shows that the greatest challenge as per the percentages was chemistry language used by teachers and book authors being difficult for learners to understand with 30%, it was also noted that chemistry calculations with 26% posed a great challenge to understanding of chemistry. Inadequate chemistry practical skills to students 22% were also another main reason.

The results for the remedies to the challenges encountered by students in understanding Chemistry concepts are presented in Table 14b.

Table 14b. Remedies to the Challenges encountered by Students in Understanding Chemistry (N = 50)

Remedies	*Frequency (f)*	*Percentage (%)*
Simple language to be used by teachers and Authors of Chemistry textbooks.	12	24
Symposiums and discussions to be Introduced in learning chemistry.	09	18
More practical to be done in all sciences especially Chemistry.	22	44
Peer counseling and remedial teaching to be done in Chemistry subject.	07	14
Total	50	100

Source: Field Data

Results in Table 14b; shows that 44% of students interviewed agreed that the solution to the challenges faced by students in learning of chemistry was to encourage more practical to be done in chemistry subject for better understanding. This could also enable the learners to get used to the calculations and language used in teaching and learning of chemistry. Students develop more practical skills and critical thinking needed in understanding of chemistry.

Application of Indigenous Knowledge in Treatment of Diseases

Do you use herbal medicine in treatment of diseases? Students' interview schedule was used to collect data on the application of indigenous knowledge in treatment of diseases. A total of 50 students were interviewed, data collected, analyzed and presented in tabular form using figures. Table 15 presents a summary of this information.

Table 15. Use of Herbal Medicine in Treatment of Diseases (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Yes	42	86
No	07	14
Total	50	100

Source: Field Data

Results in Table 15 shows that 86% of the respondents interviewed agreed that herbal medicine was highly used in treatment of diseases. While 14% denied the use of herbal medicine in treatment of diseases. The results for reasons of using herbal medicine in treatment of diseases as revealed by Students' Interview Schedule are presented in Table 16.

Table 16. Reasons for Use of Herbal Medicine in Treatment of Diseases (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Cheap and affordable.	14	28
Readily available.	16	32
Easy to prepare and administer.	15	30
Fewer side effects.	05	10
Total	50	100

Source: Field Data

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Results in Table 16 indicate that 32% of the respondents interviewed used herbal medicine because it was readily available, 30% said it was easy to prepare and administer. These are actually high indicators of using community indigenous knowledge where most of the people prefer what was cheap and locally available in treatment of diseases. Do you know the name of any medicinal plant(s) used locally in treatment of malaria disease? Students' Interview Schedule was used to collect data on students' knowledge of medicinal plant(s) used locally in treatment of malaria disease. Table 17a presents a summary of this information.

Table 17a. Students' Knowledge of Medicinal Plant(s) used locally in Treatment of Malaria Disease (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Yes	42	86
No	07	14
Total	50	100

Source: Field Data

Information obtained in Table 17a; shows that 86% of the respondents interviewed knew some plants that were used in the treatment of malaria disease while 14% did not know. This was a clear indication of the respondents having adequate knowledge of plant's chemistry and its application in learning of science especially chemistry subject. Plants have been used locally and internationally for various uses including treatment of some diseases affecting both plants and animals. Table 17b gives the summary of the results for some common medicinal plants used in treatment of malaria disease.

Table 17b. Common Medicinal Plants used in Treatment of Malaria Disease (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Neem	24	48
Aloe Vera	22	44
Cinchona	03	06
Olive	01	02
Total	50	100

Source: Field Data

Results of Table 17b; shows that 48% of the respondents interviewed used Neem plant for treatment of malaria disease. 44% of the respondents also used Aloe Vera for treatment of malaria disease hence Neem and Aloe Vera being the most common medicinal plants that were used for treating malaria disease. Are local herbs more effective in treatment of animal diseases than conventional medicine? The results for efficacy of local herbs in treatment of animal diseases as compared to conventional medicine revealed by Students' Interview Schedule are presented in Table 18a.

Table 18a. Efficacy of Local Herbs in Treatment of Animal Diseases as Compared to Conventional Medicine (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Yes	32	64
No	18	36
Total	50	100

Source: Field Data

Results in table 18a; Shows that 64% of the respondents interviewed claimed that herbal medicine was more effective than conventional medicine in the treatment of animal diseases, while 36% of the respondents denied. The results for reasons of efficacy of local herbs in treatment of animal diseases as compared to conventional medicine are presented in Table 18b.

Table 18b. Reasons for Efficacy of Local Herbs in Treatment of Animal Diseases as compared to Conventional Medicine (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Locally available.	10	20
Cheap and affordable.	13	26
Easy to prepare and administer.	15	30
Have fewer side effects	11	22
Local herbs have no prescribed dosage for its use.	01	02
Total	50	100

Source: Field Data

Results in Table 18b; Shows that 30% of respondents interviewed agreed that herbal medicine was easy to prepare and administer. 26% of the respondents also agreed that herbal medicine was cheap and affordable to many. Are local herbs more effective in treatment of plant diseases than conventional medicine? The results for efficacy of local herbs in treatment of plant diseases as compared to conventional medicine are presented in Table 19a.

Table 19a. Efficacy of local Herbs in Treatment of Plant Diseases as Compared to Conventional Medicine (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Yes	36	72
No	14	28
Total	50	100

Source: Field Data

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Results in Table 19a; shows that 72% of the respondents interviewed agreed that local herbs are more effective than conventional medicine in treatment of plant diseases while 28% disagreed with this fact. The results for reasons of efficacy of local herbs in treatment of plant diseases as compared to conventional medicine are presented in Table 19b.

Table 19b. Reasons for Efficacy of Local Herbs in treatment of Plant Diseases as Compared to Conventional Medicine (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Locally available.	16	32
Cheap and affordable.	14	28
Easy to prepare and administer.	13	26
Have fewer side effects	05	10
Local herbs have no prescribed dosage for its use.	02	04
Total	50	100

Source: Field Data

Information obtained in Table 19b; indicates that 32% of respondents interviewed agreed that local availability of herbal medicine made it to be more effective than conventional medicine. Also 28% of the respondents agreed that low cost and affordability of herbal medicine makes it more effective than conventional medicine in treatment of plant diseases. Does Indigenous Knowledge of using local herbs in treatment of various plant and animal diseases help you understand Chemistry? Students' Interview Schedule was used in collecting data on the use of Indigenous Knowledge in treatment of various plant and animal diseases using local herbs and its influence in understanding of Chemistry. Table 20a presents a summary of this information.

Table 20a. The use of Indigenous Knowledge in treatment of Various Animal and Plant Diseases using Local Herbs and its Influence in Understanding of Chemistry (N = 50)

Response	*Frequency (f)*	*Percentage (%)*
Yes	46	92
No	04	08
Total	50	100

Source: Field Data

Results in Table 20a; indicates that 92% of the respondents interviewed agreed that the use of indigenous knowledge in treatment of various animal and plant diseases using local herbs had a greater influence in the understanding of chemistry, while 8% disagreed with it. The results for reasons of using Indigenous Knowledge in treatment of various animal and plant diseases using local herbs and its influence in understanding of Chemistry are presented in Table 20b.

Table 20b. Reasons for the use of Indigenous Knowledge in Treatment of Various Animal and Plant Diseases using Local Herbs and its Influence in Understanding of Chemistry (N = 50)

Reasons	*Frequency (f)*	*Percentage (%)*
Relate plants to diseases they treat and gain practical skills needed in Chemistry.	41	82
Understand plants and their chemical values in treatment of diseases.	09	18
Total	50	100

Source: Field Data

Results in Table 20b; shows that 82% of the respondents interviewed agreed that the use of herbal medicine in treatment of plant and animal diseases influenced relating plants to the diseases they treat hence promoting gaining of practical skills required in understanding of chemistry. While 18% of respondents could only understand plants and their chemical values in treatment of diseases.

Influence of Attitude towards Community Indigenous Knowledge of Science on Students' Performance in Chemistry

Chemistry Performance Test (CPT) scores of students and total attitude scores obtained from Students' Questionnaires were used in computing the correlation between attitude towards Community Indigenous Knowledge of Science and Students' Performance in Chemistry. Table 21 presents a summary of this information.

Table 21. Correlation between Attitude towards Community Indigenous Knowledge of Science and Students' Performance in Chemistry (N = 174)

CPT Marks	*Total Attitude Score*	*Pearson's correlation co-efficient (r)*	*P value (Sig. 2- tailed)*
6.5	612	- 0.446	0.375
20.5	606		
34.5	459		
48.5	477		
62.5	486		
76.5	566		

The correlation is not significant at 0.05 level (2-tailed)
r- Critical = 0.811, p > 0.05
Source: Field Data

Table 21, shows the correlation results between students' attitude towards community indigenous knowledge of science and students' performance in chemistry. Question five of the study sought to find out whether attitude towards community indigenous knowledge of science has an influence on students' performance in chemistry. From the results of a correlation carried out on relationship between students' attitude towards community indigenous knowledge of science and students' performance in chemistry in Table 21, it was found out that there was no significant correlation between the variables at alpha (α) equal to

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0.05 (r = - 0.446, N = 174, P > 0.05). This could be attributed to students' negative attitude towards sciences. Since r-critical was greater than r-calculated (r- crit. > r-cal).

DISCUSSION OF RESULTS

The following sections represent a discussion of the results based on each analysis of the chemistry performance test (CPT) and for the five research questions

Results on Students' Chemistry Performance Test (CPT)

The results reveal that, boy's schools performed better than girl's and co-educational schools. From the results, boy's schools had a percentage of 40.8%, girl's schools with 31.9% and co-educational schools with 27.3%. The mean percentage for all boys sampled was 36.9%, girls, 30.98% while the overall mean percentage for the whole sample was 34.55%. The general performance was below average. The findings of this study are consistent with those of Changeiywo (2000) and Aduda (2003) which indicate that, many students in Kenya choose to drop science subjects when given a choice and even for those who take them, the performance is below average. At this point then, it's important to point out that students' background is a broad concept which comprises of very many factors and varies from community to community. This is for example perception towards education varies depending on the community. Poverty lowers the parent's ability to pay fees and purchase learning materials for their children. Cultural factors are also another community based factor which condemns women to be married off at an early age before completing their education. These factors contribute to poor performance in academics and also leading to school dropout particularly at secondary school level (Oxfam Uk, 1999).

Influence of Community Indigenous Knowledge on Students' Performance in Chemistry

The results obtained in this study, concur with the findings of Thrupp (1998) that, indigenous knowledge evolves in the local environment so that it's specifically adapted to the requirements of local people and conditions. It's also creative and experimental, constantly incorporating outside influence and inside innovations to meet new conditions. It's usually a mistake to think of indigenous knowledge as non-confirmative to contemporary issues in the community. From the results on the correlation between community indigenous knowledge and students' performance in chemistry, results revealed a negative relationship between community indigenous knowledge and students' performance in chemistry, at alpha (α) equal to 0.05 (r = 0.283, N = 174, P > 0.05). This means that community indigenous knowledge had a negative influence on students' performance in chemistry. The findings of this study also concurs with the research findings of Emery (1996) that, utilizing indigenous knowledge in research projects and management plans gives it legitimacy and credibility in the eyes of both local people and outside scientists, increasing cultural pride and thus motivation to solve local problems with local ingenuity and resources. Local capacity - building is a crucial aspect of sustainable development, researchers and development specialists should design approaches with support and strengthen indigenous knowledge and institutions.

Secondly, indigenous people can provide valuable input about the local environment and how to effectively manage its natural resources. Outside interest in indigenous knowledge systems has been fueled by the recent worldwide ecological crisis and the realization that its causes lie partly in the overexploitation of natural resources based on inappropriate attitudes and technologies. Researchers in science, now recognize that indigenous people have managed the environments in which they have lived for generations, often without significantly

damaging local ecologies (Emery, 1996). Many researchers in science feel that indigenous knowledge can thus provide a powerful basis from which alternative ways of managing resources can be developed.

Influence of Community Indigenous Knowledge of Students' beliefs in Cultural Interpretations of Scientific Phenomena on Students' Performance in Chemistry

The results on community indigenous knowledge of students' beliefs in cultural interpretations of scientific phenomena on students' performance in chemistry revealed a negative correlation between community indigenous knowledge of students' beliefs in cultural interpretations of scientific phenomena and students' performance in chemistry, alpha (α) equal to 0.05 ($r = -0.366$, $N = 174$, $P > 0.05$). This could be attributed to students' not being able to fit their beliefs in cultural interpretations of scientific phenomena to modern scientific knowledge especially in chemistry.

The findings are consistent with those of Hills (1989) and Ogunleye (2009) who asserted that cultural influences on science education boils down to how local community thinks about science and what they believe that are different from modern scientific thinking. The Ibo of Nigeria, Maasai, Turkana and Samburu of Kenya are still very much engrossed with superstitious beliefs. For instance, someone with medical ailments (such as heart attack or cancer) instead of seeking appropriate medical attention from the hospital would prefer to seek supernatural help from traditional healers or 'unfaithful pastors' who tell them that their problems are caused by their enemies or next door neighbours. To receive curative measures they would be asked to bring white clothes, goats or pigeons to appease the oracles. There are scientific explanations for every ailment which has nothing to do with superstition (Hills, 1989). Again, a member of the Ibo community had blamed his step-mother for contributing to the swollen of his leg, just to claim their late father's assets. He was persuaded to visit a hospital and his leg was diagnosed to be diabetes. Ignorance and superstition have dominated the thinking and behavior of some Nigerians and these do not guarantee scientific growth (Ogunleye, 2009).

Influence of Community Indigenous Knowledge of Chemistry on Students' Performance in Chemistry

The results on the influence of Community Indigenous Knowledge of Chemistry on Students' Performance in Chemistry revealed that 100% of all the 50 respondents interviewed agreed that, Indigenous Knowledge of Chemistry promoted understanding of Chemistry concepts. From research findings 26% agreed that IK promoted critical thinking, understanding plants and their chemical components and lastly development of scientific skills required in understanding of nature. The findings concur with those of Hall (2000), which indicated that, the promotion of indigenous methods of education and the inclusion of traditional knowledge also enables those in Western post-colonial societies to re-evaluate the inherent hierarchy of knowledge systems. Indigenous Knowledge systems were historically denigrated by Western educators; however, there is a current shift towards the valuing of these traditions. The inclusion of aspects of Indigenous education requires us to acknowledge the existence of multiple knowledge rather than one standard, benchmark system.

The findings of this study on the importance of IK of chemistry in herbal Medicine revealed that 70% of the respondents agreed that herbal medicine helped in understanding of various parts of plants and their medicinal values while 30% were of the idea that IK helped in classification of plants according to their medicinal uses in treatment of Animal and plant diseases. The findings concur with those of Tshikalange (2006), which indicated that, the

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success rate of traditional healers in treating sexually transmitted diseases (STDs) depends on the chemical analysis of some plants used by traditional healers. Many traditional medicinal practitioners are people without education, who have rather received knowledge of medicinal plants and their effects on human body from their bearers (Helwig, 2010). They have a deep and personal involvement in the healing process and protect the therapeutic knowledge by keeping it a secret.

The findings of this study on presence of IK of chemistry in witchcraft revealed that 62% of the respondents agreed that IK of chemistry had its use in witchcraft while 38% disagreed with this statement. On the reasons for use of IK of Chemistry in witchcraft, 34% agreed that plant parts and their extracts were used in harming other people. 32% said that, it did not promote critical thinking needed in understanding science subjects. The findings concur with those of Horn (2005), which indicated that, scientists in South Africa and other countries in Africa are testing many different plants that seem to have potential for healing illness like Malaria, TB and diabetes. Others are being considered for use as immune modulators for liver transplant patterns. *Sutherlandia frutescence* is commonly known as Cancer bush. According to a traditional healer, Credo Mutwa, the Cancer bush radiates energy and well-being, cleans blood and tonic combats.

The findings of this study on challenges encountered by students in learning of Chemistry revealed that, 30% of respondents pointed out that language used by authors in writing chemistry text books and teachers being difficult for most students to understand. 26% pointed on chemistry calculations being too difficult for many students to handle, 22% cited on inadequacy of chemistry practical skills. 12% focused on poor influence towards chemistry and lastly 10% cited on inadequate teaching and learning materials.

The findings also revealed that, the remedies to the challenges faced by students in learning chemistry were as follows; 44% of the respondents proposed that more practicals of chemistry to be done in school, 24% settled on chemistry authors and teachers to use simple language in writing chemistry text books and teaching. 18% were for symposiums and group discussions to be introduced in schools and used in learning of chemistry and lastly 14% proposed that peer counseling and remedial teaching to be done in chemistry subject in schools. The findings are consistent with those of Malatest (2002) who asserted that, in terms of educational context, the inclusion of indigenous knowledge, traditions, perspectives, world views and conceptions within curricula, instructional materials, text books and course books have largely the same effects as the inclusion of indigenous methods in education. Indigenous students and teachers benefit from enhanced academic effectiveness, success and learning outcomes, while non-indigenous students/learners and teachers often have greater awareness, respect and appreciate for indigenous communities and people in consequence of the context that is shared during the course of education pursuits.

Influence of Community Indigenous Knowledge Application in Treatment of Diseases on Students' Performance in Chemistry

The results on the influence of community indigenous knowledge application in treatment of diseases on students' performance in chemistry revealed that, 86% of the respondents interviewed agreed on the use of herbal medicine in treatment of diseases. 14% denied the use of herbal medicine in treatment of diseases. The finding concurs with those of Horn (2005), which indicates that, it's important to understand how indigenous African people relate to a globalized economy. Africans cannot avoid becoming part of what the west has achieved in the world, without forgetting that they too have something to offer from their cultures and knowledge. One needs to arrive at a new integration of indigenous knowledge

and that of the rest of the world. The findings of this study on reasons for use of herbal medicine in treatment of diseases revealed that 32% of the respondents said that it was readily available, 30% easy to prepare and administer, 28% were for the idea of it being cheap and affordable while 10% agreed that use of herbal medicine in treatment of diseases had less side effects to the users.

The findings of this study are consistent with those of Bowie et al (2005), which indicate that, the symptoms of flu, could be used to combat cancer and STDs using local medicinal herbs. Researchers have realized that this indigenous shrub common in South Africa has potent medical qualities that were known in early times by the Khoi, San and Zulu healers. Early people have observed that people suffering from cancer respond well to extract made from this plant. (*Sutherlandia frutescence* or cancer bush). This has made the hypothesize that *Sutherlandia frutescence* may assist cancer patients since there are active ingredients in this plant that assist the immune system to fight diseases. Recent (western) research has shown that the shrubs contain an amino acid that fights depression, pinitol (which help patients to gain weight) and canavanine (which is successful in treating retroviruses). It is used to treat AIDS patients today. Although it does not cure AIDS, it definitely helps people with AIDS to enjoy a better quality of their life. This is an interesting example of how modern science is giving status to the work of traditional healers.

The results on awareness of any medicinal plant used locally to treat malaria disease revealed that 86% of the respondents were aware of some local herbs used in treating malaria disease while 14% had no idea of any medicinal plant used in treating malaria disease. Also the results revealed that 48% of the respondents were familiar with Neem plant used for treating malaria disease, 44% used Aloe Vera plant, 6% were familiar with the use of Cinchona plants and lastly 2% agreed that Olive plant could also be used locally in treatment of malaria disease. The results were consistent with those of Helwig (2010), which indicates that herbalist are becoming more and more popular in Africa with an emerging herb trading market in Durban that is said to attract between 700,000 and 900,000 traders per year from south Africa, Zimbabwe and Mozambique. Smaller trade markets exist in virtually every community. Their knowledge of herbs has been invaluable in African communities and they were the only ones who could gather them in most societies. Healers commonly ‘‘described and explain illness in terms of social interaction and act on the belief that religion permeates every aspect of human existence.’’

The findings of this study on the efficacy of local herbs used in treatment of animal diseases as compared to conventional medicine revealed that 64% of the respondents had agreed on the use of local herbs in treatment of animal diseases being more effective than conventional medicine. 36% of the respondents disagreed with this statement. Also the findings of this study on the reasons for efficacy of local herbs usage in treatment of animal diseases as compared to conventional medicine revealed that 30% of the respondents agreed that local herbs were easy to prepare and administer, 26% said that local herbs were cheap and affordable, 22% were of the opinion that local herbs had less side effects to animals when used for treatment, 20% said that the local herbs were locally available while 2% said that, the local herbs had no prescribed dosage for its use.

These findings were also consistent with those of Tshikalange (2006) and Helwig (2010) which indicate that, although western medicine was successful in developed countries, it does not have the same positive impact in many of the underdeveloped African countries. Though western practices can make an impact in health care practices in certain areas such as in the spread of various diseases, it cannot integrate wholly in to the culture and society. This makes

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the traditional African practitioner a vital part of their health care system. There are many reasons why the western medicinal system does not work in Africa. Hospital and medicinal facilities are difficult for Africans to get to. With vast areas of land and poor roads and transportation system, many native Africans have to travel to immense distances on foot to reach help. Once they arrive, they are often required to wait in line up to 8 hours, especially in urban areas, as the lack of clinics and resources cause overcrowding. Patients are often not told the cause of their illness or much information about it all, so they have no way to prevent or prepare for it. The technology used is usually of poor quality, which affects the quality of treatment.

Western medicine is also too expensive for the average African to afford, making it difficult for them to receive proper care. Finally, Western medicine removes native African from their culture and tradition and forces them into a setting that they are not comfortable with, away from their family and traditions which are of utmost importance to them. They do not get the proper spiritual healing that their culture seeks and traditional ideology requires. (http:www.conserve africa.org.uk/medicinal-plants).

The findings on the efficacy of local herbs in treatment of plant diseases as compared to conventional medicine revealed that, 72% of the respondents agreed that, local herbs were more effective than conventional medicine in treatment of plant diseases. 28% of the respondents on the other hand disagreed with this statement. Also the findings on the reasons for efficacy of the local herbs in treatment of plant diseases in comparison to the conventional medicine revealed that, 32% of the respondents said that local herbs were locally available, 28% were of the opinion that the local herbs were cheap and affordable, 26% said that the local herbs were easy to prepare and administer, 10% said that the local herbs had less side effects to plants when used for treatment and lastly 4% agreed that local herbs had no prescribed dosage for its use in treatment of plant diseases. The findings concur with those of Bowie et al (2005) and Helwig (2010), which indicates that, Western medicine is too expensive for the average African to afford, making it difficult for them to receive proper care. Finally, Western medicine removes native Africans from their culture, tradition and forces them into a setting that they are not comfortable with, away from their family and traditions which are of utmost importance to them.

The findings also revealed that, 92% of the respondents agreed that, use of Indigenous Knowledge in treatment of Animal and plants diseases had a greater influence in understanding of chemistry. 8% of the respondents disagreed with this statement. The findings were consistent with those of Mokaila (2001), which indicates that, there has been more interest expressed recently in the effects of some of the medicinal plants of Africa. The Pharmaceutical industry has to consider traditional medicine as a source for identifying some of bio-active agents that can be used in the preparation of the synthetic medicine (http:www.conserveafrica.org.uk/medicinal-plants)**.** Pharmaceutical industries are looking into medicinal effects of the most commonly and widely used plants in making drugs. It's apparent that there are some things that can be learned from traditional African practice.

The findings on the reasons for use of Indigenous Knowledge in treatment of various Animal and plant diseases revealed that, 82% of the respondents agreed that IK had helped in the process of relating plants to the diseases they could cure and hence helping the learners/students to acquire more practical skills required in Chemistry, while 18% of the respondents said that IK helped the learners to understand plants and their chemical values in treatment of diseases. The findings concur with those of Mokaila (2001), which indicates that, in comparing the techniques of African healers and Western techniques, Adeoze Lambo,

a Nigerian psychiatrist stated that, ‘‘At about three years ago, we made an evaluation, a programme of their work, and compared this with our own, and we discovered that actually they were scoring almost sixty percent success in their treatment of neurosis and we were scoring forty percent- in fact, less than sixty percent’’. Horn (2005), asks the important question of what kind of knowledge natural healers have and how it differs from the knowledge taught and researched in Western Universities.

This question has a determining influence on the way Indigenous African Knowledge is perceived in the Western countries, and also on how western knowledge is used in Africa. Thus it is important to understand how Indigenous African people relate to a globalized economy. Africans cannot avoid becoming part of what the West has achieved in the world, without forgetting that they to have something to offer from their cultures and knowledge one needs to arrive at a new integration of IK and that of the rest of the world.

Influence of Attitude towards Community Indigenous Knowledge of Science on Students' Performance in Chemistry

The result on the influence of attitude towards community indigenous knowledge of science on students' performance in chemistry revealed a significant negative correlation between influence of attitude towards community indigenous knowledge of science and students' performance in Chemistry, at alpha (α) equal to 0.05 ($r = -0.446$, $N = 174$, $P > 0.05$). This was attributed to students' negative attitude towards sciences. The findings of this study are not consistent with those of Papanastasiou (2001), who reported that, those who have positive attitude towards science tend to perform either in the subject.

The effective behaviors on the classroom and strongly related to achievement, and science attitudes are learned (George & Kaplan, 1998). Teachers play a significant role during the learning process and they can directly or indirectly influence the students' attitude towards science which in consequence can influence students' performance. What teachers like and dislike, appreciate and how they feel about their learning or studies could have a significant effect on their students. By extension, how teachers teach, how they behave and how they interact with students can be more significant than what they teach.

Students' attitude towards the learning of Chemistry is a factor that has long attracted attention of researchers. Ojo (1989) and Adesokan (2002) asserted that in spite of realization of the recognition given to Chemistry among the science subjects, it is evident that students still show negative attitude towards the subject, thereby leading to poor performance and low enrolment. In response to the challenges posed by the influence of community Indigenous knowledge of science on students' performance in Chemistry and low enrolment in science subjects, several studies have been carried in Kenya to investigate the possible causes (Eshiwani, 1974; Kyalo, 1984; Mondoh, 1986 & Wachanga, 2002). Majority of previous studies centered on the instructional methods used by the teachers, however, Haimowitz (1989), noted that the causes of most failures in schools might not be due to insufficient or inadequate instructions but perhaps by negative attitude of the learners towards science subjects.

CONCLUSIONS

Based on the findings of the study, the following conclusions were made:

1. The correlation between community indigenous knowledge and students' performance in Chemistry, results revealed a significant negative relationship between community indigenous knowledge and students' performance in chemistry.

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This means that, community indigenous knowledge had a negative influence on students' performance in chemistry.

2. The correlation between community indigenous knowledge of students' beliefs in cultural interpretations of scientific phenomena and students' performance in chemistry, results revealed a negative correlation between the variables. This means that community indigenous knowledge of students' beliefs in cultural interpretations of scientific phenomena had a negative influence in understanding of chemistry.
3. Community indigenous knowledge of chemistry promoted understanding of Chemistry concepts by the students. This is because it promotes critical thinking and development of scientific skills required in understanding of chemistry.
4. Community indigenous knowledge application in treatment of both Animal and plant diseases using local medicinal plants, promotes understanding of chemistry. This was because students were able to relate plants to the diseases they cure and hence developing more practical skills required in understanding of chemistry.
5. The correlation between attitude towards community indigenous knowledge of science and students' performance in chemistry, results revealed a negative correlation between the variables. This means that, students' attitude towards community indigenous knowledge of science did not promote students' understanding of chemistry.

RECOMMENDATIONS

On the basis of the results of this study, the following recommendations are made:

1. The Ministry of Education should initiate in-service courses for science teachers to equip themselves with the skills of Community Indigenous Knowledge so as to enhance their effectiveness in teaching of science subjects.
2. Learning of Chemistry and other science subjects in secondary school curriculum should be practical oriented and student centered. This could help students interpret their cultural beliefs in scientific phenomena to modern science hence enhancing understanding of chemistry and other sciences.
3. The Government of Kenya through the ministry of Education should integrate Indigenous Knowledge of Science in to secondary school curriculum so as to enhance the teaching and learning of Chemistry and other sciences.
4. Students in secondary school should be exposed to more practical activities using locally available materials for example plant parts or their extracts so that they can perform simple chemical analysis and relate it to their applications in real life situations.
5. The ministry of Education, NGO's and school sponsors should initiate educational seminars or workshops for science teachers and students to equip them with the skills of attitude change towards Community Indigenous Knowledge of Science so as to enhance their efficacy in teaching and learning of science subjects.

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