RESEARCH ARTICLE
A CORRELATION STUDY OF SECONDARY STUDENTS ACADEMIC ACHIEVEMENT IN CHEMISTRY AND THEIR CHEMISTRY SELF-CONCEPT

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ABSTRACT
The present study is an attempt to study secondary school students’ academic achievement in Chemistry in relation to their chemistry self-concept. Simple random sampling technique is used in the selection of sample. In the present investigation a sample of 721 higher secondary students from 4 counties in Kenya were selected. Two validated research instruments were used; Chemistry Achievement Test (CAT) was used to assess student’s academic achievement in chemistry while the Students Self-Concept Questionnaire (SSCQ) was used to measure learners self-concept towards chemistry subject. Result showed that there is a positive and significant correlation between academic achievement in Chemistry and Chemistry Self-Concept.

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INTRODUCTION
Self-concept comprises of people’s attitudes, feeling, the perceptions that an individual assigns to herself or himself and characteristics. It is one’s ideas of the self in relation to others and the environment (Bauer, 2005; Marsh, 2006). Children’s levels of self-concept are evident in their behaviour and attitudes. If children feel good about themselves, these good feelings will be reflected in how they relate to friends, teachers, siblings, parents, and others.

Chemistry Self-concept refers to the beliefs, hypothesis and assumptions that the individual has about chemistry subject. Chemistry self-concept is self measure of a student’s feelings toward chemistry subject or chemistry concepts. It includes what people know about themselves in relation to chemistry as a subject through experience, reflection and feedback from other people like teachers, peers and parents. Just like self-concept, chemistry self-concept is an organised cognitive structure comprised of a set of attitudes, beliefs and values that cut across all facts of experience and action organizing and trying together the variety of specific habits, abilities, outlooks, ideas and feelings that a person displays (Young, 1998; Marsh, 1990a; Sanchez & Rodah, 2003).

Students come to chemistry class with diverse interests, background information about the subjects from peers and perceptions on the subject. Student's levels of chemistry self-concept are evident in their behaviour and attitudes towards the subject. Students self-concept in chemistry may further be shaped and directed by such factors as; the practical activities carried out in a chemistry lesson, through science process skills teaching approach, availability of resources required in teaching and learning of chemistry, teaching approach used in teaching of chemistry among others. If student feel good about chemistry as a subject, these good feelings will be reflected in how they relate to chemistry concepts, chemistry teachers, and chemistry related activities eg laboratory practical, how much time the student allocated to the subject and eventually academic achievement in the subject.

Review Of Literature
The literature on poor academic performance by school pupils reveals as causes factors related to personal characteristics of pupils (Thompson & Standford, 1975; Reinhart, 1976 and Belkin, 1981) and factors related to the pupils’ environment - the school and the home (Little & Thompson, 1983). One of these personal characteristics of students is subject self-concept.

According to Byrne & Shavelson (1987) multidimensionality and hierarchy of various Self-concept Constructs, mathematic and science self-concept domain falls under the academic dimension. Maximising self-concept of ability in an academic subject is recognised as a critical goal in itself and means to facilitate the attainment of the desirable outcomes in education such as academic effort and persistence at task, attributions to failure or success, educational aspirations, academic achievement, course work selection, completion of high school and subsequent university attendance (Marsh, 1991 and 1993).

Objectives Of The Study
• To determine students chemistry self-concept by gender
• To establish the relationship between learners’ chemistry self-concept and academic achievement in chemistry.

Hypothesis
There is no statistically significant relationship between learners’ chemistry self-concept and academic achievement in chemistry.

METHOD
Research Design
The research design was mainly descriptive study. Descriptive research design was found to be appropriate since it can be used to determine the nature of prevailing conditions or relationships and practices that exist (Cohen & Manion,
1987). The research method of the study was cross-section survey since information collected was drawn from predetermined population (Borg & Gall, 1989). Its main purpose is to explore and describe the variable under the study (Kathuri & Pals, 1993, Cohen & Manion, 1987).

### Table 1 Number (N) and percentage (%) of Students Chemistry Self-Concept by Categories

<table>
<thead>
<tr>
<th>Category of chemistry</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ve Self-concept</td>
<td>611</td>
<td>85.93</td>
</tr>
<tr>
<td>-ve Self – Concept</td>
<td>96</td>
<td>14.0</td>
</tr>
<tr>
<td>Total</td>
<td>707</td>
<td>100</td>
</tr>
</tbody>
</table>

### Sample

The guidelines given by Gall, Borg, Gall (1996) was adapted in determining the sample size. Where correlation coefficient (r) is used to test hypothesis at 0.05 level of significant, a minimum sample of 384 cases is required. When the independent sample t test is used, a minimum sample of 386 is required (Gall, Borg, Gall 1996). In view of this, a sample of 711 students were selected for the study.

### Table 2 Number (N) and percentage (%) of Students Chemistry Self-Concept Categories by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>% of Students</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Student with +ve Chemistry self-concept</td>
<td>241</td>
<td>81.5</td>
<td>374</td>
</tr>
<tr>
<td>Students with –ve Chemistry self-concept</td>
<td>55</td>
<td>18.5</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>296</td>
<td>100</td>
<td>415</td>
</tr>
</tbody>
</table>

Simple random sampling was used to select 12 secondary schools involved in the study. These schools were selected from 4 counties in Kenya. These schools formed the sampling frame in the random sampling of the study sample of 711 students of which 296 were boys and 415 were girls.

### Table 3 Person Product Correlation Coefficients for Learners’ Scores in the Chemistry Achievement Test and Students Self-Concept Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std dev</th>
<th>Chemistry Achievement Test</th>
<th>Students self concept Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry achievement test</td>
<td>29.22</td>
<td>17.395</td>
<td>1</td>
<td>0.264**</td>
</tr>
<tr>
<td>Chemistry self -concept scores</td>
<td>161.276</td>
<td>46.127</td>
<td>0.264**</td>
<td>1</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level*

### Instrumentation

**Two instruments were used in the study**

Chemistry Achievement Test (CAT). The CAT had 30 items on chemistry concepts taught in secondary school. All the items were open-ended and were drawn from all the topics taught in secondary school. It was aimed at assessing learners’ academic performance in chemistry. Items in CAT were not scored dichotomously, scores ranged from 1-5 marks. The maximum score of the test was 100% while the minimum was 0%.

Student Self-Concept Questionnaire (SSCQ). The SSCQ had 46 items with 5 point or likert scale. The highest score in the scale is (5) while the lowest is (1) per item. For questions with a positive stem strongly agree (SA) were scored highest (5) while strongly disagree (SD) were scored lowest (1). For those questions with a negative stem strongly agree (SA) were scored lowest (1) while strongly disagree (SD) were scored highest (5). The maximum scores were 230 while the minimum were 46.

### Analysis And Interpretation Of Data

Students who score 1-114 (less than a half of the total scores) was considered to have –ve chemistry concept while those who scored 115-230 (a half score and above) were considered to have +ve chemistry self-concept.

Results in Table 1 indicates that a total of 611 (85.93%) of all the students have positive self-concept towards chemistry. 14.07% of the total students have negative self-concept towards chemistry subject.

### Students’ Chemistry Self-Concept by Gender

In order to reflect on the students self-concept by gender analysis was done and results shown in Table 2.

The results in table 2 indicate that 374 (90.1%) of all the girls have a positive self-concept toward chemistry while 241 (81.5%) of all the boys have positive self-concept. 18.5% of the boys and 9.9 % of the girls had negative self-concept toward chemistry. This means that more girls had positive self-concept toward chemistry than boys.

### Relationship between students’ academic achievement in chemistry and their chemistry self-concept.

Scores in the CAT and SSCQ were correlated using Person Product Moment coefficient (PPMC).

The results in table 3 show that the mean score in CAT was 29.22 with a standard deviation of 17.395. The mean score in students’ self-concept questionaire was 161.276 with a standard deviation of 46.127. Pearson correlation coefficient for the scores in CAT and SSCQ was r = 0.264. This was identified as being significant at 0.05 level. This means that the correlation between the two score is positive and significant. Therefore the null hypothesis is rejected.

### DISCUSSION

Results of this study show that there is a statistically significant relationship between learners’ chemistry concept and their academic achievement in chemistry. This means a positive self-concept in chemistry is essential for a good mastery of chemistry concept.

### Implications

Self-concept plays a significant role on student academic achievement and so does the chemistry self-concept on chemistry academic achievement. This is seen from the
findings of this study which showed a positive correlation between learners chemistry concept and chemistry academic achievement. Therefore, educational institutions should strive to develop positive chemistry self-concept of the student as a strategy of posting academic achievement in chemistry.

CONCLUSIONS

There is a positive correlation between student’s academic achievement in chemistry and their chemistry self-concept. Most girls have a positive chemistry self-concept than boys hence girls had a higher mean score than boys in the chemistry achievement test. Therefore if teachers and educational institutions wish to improve academic achievement in chemistry subject they will need to work on learners self-concept.

References


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