Effects of Concept Attainment Strategy on Academic Achievement and Interest of Secondary School Students in Chemistry in North East, Nigeria

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Abstract
This study examined the Effects of Concept Attainment Strategy on the Academic Achievement and Interest of Chemistry Secondary School Students in north east, Nigeria. Four (4) Research objectives, Research questions and Hypotheses were used to guide the study. The design used for this study was a pre-test, post-test quasi experimental control group design. The target population of the study constitutes SS2 chemistry secondary school students in the six north eastern states. A total of one hundred and thirty-eight (138) students were selected by stratified simple random sampling to form the sample of the study. The instruments used for data collection in this study were Chemistry Achievement Test (CAT) and Students’ Interest towards chemistry Questionnaire (SITCQ) with reliability coefficient of 0.8 and 0.7. The major findings of the study are concept attainment strategy has positive effect on both the academic achievement and the interest of secondary school students. The study also proves that the strategy develops positive academic achievement in students and improves knowledge. Based on findings of the study, it was recommended that the use of the strategy should be emphasized through conferences/workshops by professional bodies.

Keywords: Concept Attainment Strategy, Science Education, Academic Achievement, Interest.

Introduction
Science is an intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment (ICSU, 2011). This definition viewed science as subject that encompass the development, understanding and the application of the physical and life science and scientific studies and applications within which specific subjects like chemistry, physics, biology and (general) science are taught. Science and technology are recognized worldwide as vital for a nation's overall economic development (Avaa, 2011). When science and technology are used effectively it is capable of improving productivity and meets the needs of a society. This has been demonstrated in the developed countries, and more recently in the newly industrializing countries, where science and technology have been responsible for more than half of the increase in productivity (Kola, 2013). However, the process of
facilitating the learning science or the acquisition of scientific knowledge, skills, values, beliefs and habits is called science education (Bunkure, 2017).

Science education deals with sharing of science content and process with individuals who are not considered traditionally to be member of the scientific community; the individuals could be students, farmers, market women or a whole community. In Nigeria science education concentrates on the teaching of science concepts, method of teaching it and as well addressing misconceptions held by learners regarding those concepts (Alam, 2017). Since it is through science education that science concepts are learned, therefore science education is very important to the development of the nation and that is why every nation must take it very serious in its institutions of learning to enable the knowledge pass to members of the society and to subsequent generations.

Science education comprises three subjects namely biology, chemistry and physics which are combined with education (Kola, 2013). Therefore, science education is a relatively broad and dynamic area in which humanity has placed a premium expectation for future growth and development, which means science education, will well into the future, continue to play a significant role in advancing the frontiers of developmental efforts.

The ability to learn chemistry concepts and think critically is essential for secondary school students because its knowledge is a prerequisite to all science courses at higher level (Mayer, 2012). Chemistry is sometimes called the central science because it provides a foundation for understanding both basic and applied scientific disciplines at a fundamental level. It also plays an important role in daily life. Its principles are important in diverse areas, such as: weather patterns, functioning of brain and operation of a computer. Chemical industries manufacturing fertilizers, alkalis, acids, salts, dyes, polymers, drugs, soaps, detergents, metals, alloys and other inorganic and organic chemicals, including new materials, contribute in a big way to the national economy. This indicates that the knowledge of chemistry is very important to the development of a nation.

Despite the enormous importance of science education, chemistry in particular, there has been a concern on students’ poor performance in science subjects particularly chemistry. As Olajire (2018) stated that poor performance is one of the greatest concerns nationally and if this is not looked into, children will have to face the effect of poor academic performance which includes examination malpractice, gloomy future etc. Also, Ngema (2016) stated that the performance in science subjects and low enrolment rate in the science faculties at tertiary institution is a threat to Nigerian development and economy. This failure and poor performance may be linked to ineffective teaching method. As observed by Ganyaupfu (2013) quite remarkably; regular poor academic achievement by the majority students is fundamentally linked to application of ineffective teaching methods by teachers to impart knowledge to learners.

The primary purpose of teaching at any level of education is to bring a fundamental change in the learner (Tebabal & Kahssay, 2011). In Nigerian secondary schools the teaching approach that the teacher adopts is the traditional teacher-centered lecture (chalk and talk) approach, which emphasizes the transfer of knowledge, skills and rewards memorization
(Obiyemi and Yusuf, 2016). But the traditional teaching method does not allow much room for critical analysis of issues but it makes students to duplicate the notes given back to the teacher. The method rarely creates interest or draws attention of the young people (secondary school students) because they are kept passive listeners (Ahmad, 2014).

The concept attainment strategy will be an effective teaching method that will engages students in creating their own definitions for a concept and it will help them in increasing the understanding of the concepts (Mayer, 2012). This will engage students to think about their learning and had a positive effect on their attitudes and motivations in class. Concept attainment is the process of defining concepts by determining the attributes that are absolutely essential to the meaning and discriminate between what is and what is not an example of the concept (Talkmitt, 2015). It is designed to teach concepts and help students become more efficient at learning and creating concepts. It is effective in defining, comprehending, applying, and using concepts designed to lead students to a concept by asking the students to compare and contrast examples that contain the characteristics or attributes of the concepts with examples that do not contain these attributes. It is based on the assumption that one of the best ways to learn a concept is by observing examples of it (Shamnad, 2005). Therefore, concept attainment strategy is fully a learner centered teaching as it tends to attract the interest of a learner and motivate them towards better understanding of a concept. In this study, the researcher investigated effect of concept attainment strategy on academic achievement and interest of students towards chemistry on secondary school students.

Interest is a powerful motivational process that energizes learning, guides academic and career trajectories, and is essential to academic success (Harackiewicz, Smith, & Priniski, 2016). It is a feeling of curiosity or concern about something that makes attention turns towards it (Adekunle & Oyewumi, 2016). It was observed that interest-triggered learning activity leads to a higher degree of deep level learning as such promoting students’ interest can contribute to a more engaged motivated, learning experience for students. Concept attainment strategy allows students to participate in learning and generate hypotheses by themselves which may lead to the development of student’s interest and attaining high level of academic achievement.

Academic achievement is an outcome of the performance that indicates what level of personal and educational goals a student has achieved at school (Verešová & Foglová, 2017). This is in line with Amuda, Ali and Durkwá (2016) who viewed academic achievement as an expression used to represent student’s scholastic standing. Also, Shrodhanga (no date) understood academic achievement to be an average mark obtained by an individual in the final examination which is in line with this study and it may or may not vary according to gender. Ahmad (2014) observed that the students’ academic achievement in chemistry is worsening as years go by and that many students seems to have negative attitude towards the subject. This low academic achievement may be link to the student’s difficulty in understanding chemistry and perhaps account for the consistent poor academic achievement in the
subject in senior secondary school examinations. This circumstance may be partly blamed on teacher’s persistent use of traditional method which may hardly attract the interest of a learner irrespective of gender. Gender is one of such factors also mentioned in literature to have considerable effects on students’ academic performances especially in science subjects. Gender is the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population. The importance of examining performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. Gender as a factor in science achievement has generated a lot of concern for science educators.

**Statement of the Problem**
The role of secondary education is to lay the foundation for further education and if a good foundation is laid at this level, there are likely to be fewer problems at subsequent levels. But the performance and academic achievement of students in chemistry is apparently poor in Senior School Certificate Examination. Chief examiners report on WAEC results in north eastern state over the years often revealed low academic achievement of students to meet the university requirement.

The study further revealed that over 50% of the candidates that were examined over the period of observation did not score credit in chemistry which is required for admission purpose to read science-based courses in the tertiary institutions. This situation is disturbing and not in the best interest of the science and technological growth and development of the country. More importantly, many researchers have independently attributed the blame to teacher’s poor instructional methods, lack of organizational skills and inadequate exposure to instructional strategies. However, this poor academic achievement could be as a result of lack of competent teacher and effective teaching method, effective teaching aids etc. Aniodoh and Egbo, (2013) have attributed the observed student poor academic achievement in chemistry to use of inappropriate and ineffective teaching method by chemistry teachers. As such students seem to lack interest in science and seem not motivated to improve.

It is therefore very crucial to examine the effect of the concept attainment instructional strategies in use at our secondary schools on the students’ academic achievement and interest bearing in mind the negative consequences of poor academic achievement deterring students from pursuing Chemistry as a subject. Hence this research set out to determine the effect of concept attainment strategy on the academic achievement and the interest in chemistry secondary school students.

**Objectives of the Study**
The following objectives were formulated to guide the study, these are to:

1. find out the effect of concept attainment strategy on the academic achievement of secondary school students in chemistry,
2. determine the effect of concept attainment strategy on the interest of secondary school students in chemistry,
3. find out the effect of concept attainment strategy on the academic achievement of male and female senior secondary school students’ chemistry,
4. determine the effect of concept attainment strategy on the interest of male and female senior secondary school students in chemistry.

Research Questions
This study answered the following questions
1. What is the difference in the mean academic achievement scores of chemistry students exposed to concept attainment strategy and those taught with lecture method?
2. What is the difference in mean interest rating scores of chemistry students exposed to concept attainment and those taught with lecture method?
3. What is the difference between male and female students mean academic achievement scores when taught chemistry using concept attainment strategy?
4. What is the difference between male and female students mean interest rating score in chemistry when exposed to concept attainment strategy?

Research Hypothesis
The following hypotheses were formulated and tested at P≤0.05 level of significance
1. There is no significant difference in the academic achievement between senior secondary school students taught using concept attainment strategy and those taught using conventional method.
2. There is no significant difference in the interest between senior secondary school students taught using concept attainment strategy and those taught using conventional method.
3. There is no significant gender difference in the academic achievement of students taught using concept attainment strategy in senior secondary school chemistry
4. There is no significant gender difference in the interest of students taught using concept attainment strategy in senior secondary school chemistry.

Significance of the Study
The study is of significance to the following stakeholders in science education.

i. Curriculum planners: curriculum planners can incorporate concept attainment in various schools and subjects’ curriculum materials like text books and instructional materials to make needed changes in the way and methods chemistry is to be taught especially when it comes to reviewing present curriculum practice in science.

ii. It can be adopted by science teachers: it is expected that this study will help science teachers to enrich their method of teaching in their schools by exposing them to
the use of concept attainment strategy which will in turn make it easy for the students to comprehend and increase their academic performance.

iii. This study would be significant to those educational administrators and academicians who are concerned with educational strategies. By adopting this strategy in schools, it is hope that the research helps them in finding out possible approach and strategy that simplify the teaching and learning of difficult concepts in chemistry.

Scope of the Study
This research was delimited to chemistry students of north eastern zone secondary schools. SS II students were chosen because they were already introduced to chemistry and are not yet at the final stage of secondary school, which make them ideal for this study. The SS II students are at an average age of 14-20 years. In this study, the topics that are considered as areas of weaknesses in chief examiners report will be taught to the students. It is due to the presence of the topics in national scheme of work as well as the consistent occurrence of the aspects in West African Examination.

Review of Related Literature
The term Concept Attainment Model is historically linked with the work of Jerome S. Bruner and his associates in 1956. The work of Jerome Bruner in this area is noteworthy; he presented this work in his book titled beyond the information given in 1973. His method of concept attainment has been shaped into a model of teaching by Bruce Joyce and Marsha Weil in 1980. The Model is intended to teach specific concepts by comparing and contrasting examples that contain the concept and those that do not contain the concept (Kumar and Mathur, 2013). It is the process of defining concepts by finding those attributes that are absolutely essential to the meaning and disregarding those attributes that are not (Gunter, Estes, and Schwab, 2003).

Concept attainment model is a product of students’ engagement in the process of defining concepts inductively by comparing examples and non-examples of the concept until definition is derived thus; students become authorities in what they are taught (Naik, 2010). This model is designed to lead students to a concept by asking them to compare and contrast examples that contain the characteristics or attributes of the concept with examples that do not contain these attributes.

Concept Attainment is a constructivist approach to teaching and learning drawn from the work of Bruner in 1956. In this instructional strategy students apply their prior understanding to determine the attributes of a concept through the processes of comparing and contrasting (Suhendi, 2018). This is in line with constructivism view of learning as a socially situated activity that could only occur through interaction with other. Instead of having the students relying on someone else’s information to achieve their academic success and accepting it as truth, the constructivism learning theory supports that students should be exposed to data, primary sources and the ability to interact with other
students so that they can learn from the incorporation of their experiences. Teachers are therefore left with the principal responsibilities to provide examples, record student data, and ask probing questions while the students interact analyze and hypothesize themselves (Naik, 2010). Constructivist theory is therefore considered a frame for this study because it best explained the ideology of concept attainment strategy which includes learning through an active participation/involvement of students in learning. This gives the students chance to think and construct ideas by them self.

**Research Methodology**

The design for this study was quasi experimental design using pretest, posttest experimental and control group. Both the Experimental and control groups were pretested to determine the level of students’ academic achievement and interest before the intervention. Students’ interest towards chemistry questionnaire (SITCQ) and Chemistry Achievement Test (CAT) were administered to the students to determine their interest and academic achievement in chemistry respectively before intervention. An intervention for both Experimental and control group lasted for four weeks using concept attainment strategy for experimental group and conventional method for control group. Post-test was administered to the two groups to get the effect of concept attainment strategy on the academic achievement and interest of students in the topics.

The population of this study consists of all the SS2 chemistry students from the six north eastern states. The zone has six states namely; Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe. Data obtained from statistics bureau indicates that there are 104,850 SS2 students in the states. Generally, the schools are either girl’s school, boy’s school or mixed schools. Hence, the targeted population is only the SS 2 classes in secondary schools which are coeducational and are said to offer science subjects chemistry inclusive, this is due to the interest in gender. Two schools were randomly selected using stratified random sampling to form the sample size.

The instrument used for this research was a chemistry achievement test (CAT) which was adopted from a standard examination (WAEC & NECO) past question paper from 2019-2023. The CAT was used to test student’s academic achievement and a student interest towards chemistry questionnaire (SITCQ) adapted from Sani, (2018) was used to examine the interest of the students.

**Data Presentation and Analysis**

**Research Question One:** What is the difference in the mean academic achievement scores of chemistry students exposed to concept attainment strategy and those taught with lecture method?
Table 1.1: Mean and Standard Deviation of Posttest Scores for Experimental and Control Groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Std Error</th>
<th>MnDf</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPERIMENTAL</td>
<td>65</td>
<td>26.25</td>
<td>9.74</td>
<td>1.21</td>
<td>9.11</td>
</tr>
<tr>
<td>CONTROL</td>
<td>73</td>
<td>17.14</td>
<td>6.60</td>
<td>.77</td>
<td></td>
</tr>
</tbody>
</table>

It is clear from the Table 1.1 that posttest mean score of control group 17.14 is less than posttest mean score of experimental group 26.25, which implies that the teaching strategy has a positive effect on students’ academic achievement. The mean difference 9.11 is in favor of experimental group posttest Chemistry Achievement Test. However, the standard deviation of the two groups; control 6.60 and experimental 9.74 indicated that the students’ scores were far from each other. From this analysis, it can be concluded that the concept attainment strategy has a positive effect on the academic achievement of senior secondary school students in Chemistry.

Null hypothesis One: There is no significant difference in the academic achievement between senior secondary school students taught using concept attainment strategy and those taught using conventional method.

Table 1.2: t-test Analysis of Posttest Mean Scores of Control and Experimental Groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>df</th>
<th>A</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPERIMENTAL</td>
<td>65</td>
<td>26.25</td>
<td>9.74</td>
<td>136</td>
<td>0.05</td>
<td>0.000</td>
<td>Significant</td>
</tr>
<tr>
<td>CONTROL</td>
<td>73</td>
<td>17.14</td>
<td>6.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*significant at α P 0.05 level

Table 1.2 reveals the t-test analysis of posttest mean score of Control and Experimental group. It is evident that computed probability value yielded 0.000 which is less than significance level 0.05, indicating that null hypothesis one stated in this study is rejected. Therefore, there is significant difference in the academic achievement of senior secondary school students taught using concept attainment strategy and those taught using traditional method.

Research Question Two: What is the difference in mean interest rating scores in chemical reaction and electrolysis of chemistry students exposed to concept attainment and those taught with lecture method?

Table 1.3: Mean and Standard Deviation of Effect of Concept Attainment Strategy on Students’ Interest

<table>
<thead>
<tr>
<th>SIQ_Category</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Std Error</th>
<th>Mn diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRETEST</td>
<td>65</td>
<td>17.09</td>
<td>6.77</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>POSTTEST</td>
<td>65</td>
<td>26.25</td>
<td>9.74</td>
<td>1.21</td>
<td>9.15</td>
</tr>
</tbody>
</table>
The mean scores of students' interests in Chemistry before and after are 17.09 and 26.25 and the standard deviations before and after treatment were 6.77 and 9.74 respectively. From this analysis, it is clearly indicated that students' interest is higher in Chemistry after they have been exposed to the new methodology. The mean difference 9.74 is in favor of posttest score of students' interests in Chemistry. Therefore, it can be deduced that the concept attainment strategy methodology adopted by the teacher has a positive effect on the students' interests in senior secondary school Chemistry.

**Null hypothesis Two:** There is no significant difference in the interest between senior secondary school students taught using concept attainment strategy and those taught using traditional method.

**Research Question Three:** what is the difference between male and female students mean academic achievement scores when taught chemistry?

**Table 1.5:** Mean and Standard Deviation of Chemistry Achievement Posttest Scores of Experimental group of Male and Female Students

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Std Error</th>
<th>Mn Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>36</td>
<td>24.83</td>
<td>10.03</td>
<td>1.67</td>
<td>3.17</td>
</tr>
<tr>
<td>Male</td>
<td>29</td>
<td>28.00</td>
<td>9.23</td>
<td>1.71</td>
<td></td>
</tr>
</tbody>
</table>

It is clear from the Table 1.5 that in the posttest conducted, female students' mean score of CAT yielded 24.83, which is less than that of male students CAT 28.00. This implies that posttest score of male students in CAT after exposing them to the adopted teaching methodology has slightly higher scores compared to their female counterparts. The mean difference 3.17 is in favour of male students and the standard deviation of female and male students are 10.03 and 9.17 respectively indicated that the students' scores after the use of
the attainment strategy achievement were very close to one another. From this analysis, it can be concluded that male students performed slightly better than their female counterparts in the Chemistry Achievement Test when the concept attainment strategy is adopted.

**Null hypothesis Three:** There is no significant difference in gender in the academic achievement of students taught using concept attainment strategy in senior secondary school chemistry.

**Table 1.6:** t-test Analysis of Experimental Posttest Mean Score of male and female Chemistry Students Achievement Test

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>A</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>36</td>
<td>24.83</td>
<td>10.03</td>
<td>63</td>
<td>0.05</td>
<td>0.16</td>
<td>No Significant</td>
</tr>
<tr>
<td>Male</td>
<td>29</td>
<td>28.00</td>
<td>9.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.6 shows that the observed p-value of 0.162 is higher than 0.05 level of significance. The calculated mean achievement scores were 24.83 and 28.00 for female and male students in the experimental group. Consequently, the null hypotheses which states that there is no significant difference between the mean academic achievement scores of male and female students taught using concept attainment is accepted.

**Research Question Four:** what is the difference between male and female students mean interest rating score in chemistry when exposed to concept attainment strategy?

**Table 1.7:** Mean and Standard Deviation of Interest Rating Scores of Male and Female Student of the Experimental Group

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Std Error</th>
<th>Mn Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>36</td>
<td>59.89</td>
<td>10.96</td>
<td>1.83</td>
<td>4.08</td>
</tr>
<tr>
<td>Male</td>
<td>29</td>
<td>63.97</td>
<td>14.48</td>
<td>2.69</td>
<td></td>
</tr>
</tbody>
</table>

The mean for male and female students was found to be 63.97 and 59.89 which shows that there are 4.08 mean differences. The standard deviation was 14.48 for male and 10.96 for the female students. This shows that male students who were exposed with concept attainment strategy develop higher interest than the female counterpart in the experimental group.

**Null hypothesis Four:** There is no significant difference in gender in the interest of students taught using concept attainment strategy in senior secondary school chemistry.
Table 1.8: t-test Analysis of Experimental Posttest Interest Rating Mean Score of Male and Female Students in Chemistry

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>A</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>36</td>
<td>59.89</td>
<td>10.97</td>
<td></td>
<td>63</td>
<td>0.05</td>
<td>0.22</td>
</tr>
<tr>
<td>Male</td>
<td>29</td>
<td>63.97</td>
<td>14.48</td>
<td></td>
<td></td>
<td></td>
<td>No Significant</td>
</tr>
</tbody>
</table>

Table 1.8 shows p-value is 0.22 which is greater than 0.05 level of significance, hence the hypothesis which stated that there is no significant difference in interest of male and female chemistry students taught using concept attainment strategy is accepted.

Summary of Major Findings
Based on outcome of the analysis, the followings are the major findings of this study:

i. The students who were taught chemistry using concept attainment strategy have higher mean scores than those taught using traditional method. This finding shows that there is significant difference in the academic achievement between senior secondary school students taught using concept attainment strategy and those taught using conventional method.

ii. There is a positive effect of concept attainment on the interest of students taught chemistry using the method. Hence, there is significant difference in the interest between senior secondary school students taught using concept attainment strategy and those taught using conventional method.

iii. There is no significant gender difference between male and female students academic achievement in chemistry when taught using concept attainment strategy in senior secondary school chemistry.

iv. There is no significant difference in male and female in the interest of chemistry students taught using concept attainment strategy in senior secondary school chemistry.

Conclusions
Based on the findings of this study, the following conclusions were drawn:

i. Students exposed to concept attainment strategy in the present study performed much better than those taught chemistry by means of conventional teaching method. This means that concept attainment strategy enhanced students’ academic achievement in learning of chemistry.

ii. Concept attainment strategy improved the interest of students in learning chemistry.

iii. Concept attainment strategy is gender friendly as the result indicated that there are no differences between the performance of male and female students who learnt chemistry by means of concept attainment strategy. This means that concept
attainment strategy enhanced academic achievement in learning of chemistry regardless of gender.

iv. Concept attainment strategy has no effect on the interest of students by gender. This shows that male and female students developed interest after been exposed to concept attainment strategy.

**Recommendations**

Based on the findings of this study, the following recommendations were made, that:

i. The use of concept attainment strategy improved academic achievement of students in the present study. Therefore, curriculum planners and educational administrators should through workshops and conferences encouraged chemistry teachers to use concept attainment as alternative strategy that they can fall back on in order to improve the teaching and learning of senior secondary chemistry students.

ii. Male students have higher academic achievement better than the female. Therefore, teachers should encourage female students during lesson to learn to work cooperatively to improve on their academic achievement.

iii. The use of concept attainment strategy should be recommended by curriculum planners and educational administrators in the curriculum of secondary school chemistry. The effective use of the teaching approach should be reflected in the curriculum materials like the textbooks and instructional materials.

iv. There should be workshop by the government and schools to sensitize science teachers on the importance of the strategy and how best to use the strategy in classroom to arouse the interest of secondary school students irrespective of gender.

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