EFFECT OF CONCEPT MAPPING INSTRUCTIONAL STRATEGY ON STUDENTS RETENTION IN BIOLOGY

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Abstract

The purpose of the study was to find out the effect of concept mapping instructional strategy on student’s retention in Biology. The design of the study was quasi-experimental design. Specifically, non-randomized control group pre-test post-test design was used for the study. Two randomly selected intact classes from two schools were used and the students in the classes were assigned to experimental group or control group. The experimental groups were taught with concept mapping instructional strategy, while the control groups were taught with lecture method. Biology Retention Test (BRT) was the instrument used for data collection. Analysis of covariance (ANCOVA) was used to analyze data that were collected. The result of the study shows that concept mapping instructional strategy enhances retention in Biology.

Education is the process of imparting and acquiring knowledge through teaching and learning, especially at a school or similar institution (Encarta World English Dictionary, 2009). Education is very important for the success of an individual in life. It provides learners with the knowledge and skills that prepares them for the works of life. In fact through education the society grows and develops by bringing about the desired societal changes.

Learning is acquiring new knowledge or modifying existing knowledge, behaviour, skills, attitudes and values. Human learning occurs as part of education, personal development, or training. Arends (2001) defined learning as a process where instruction or teaching causes a change in the behaviour and knowledge of an individual. This implies that through teaching learning is acquired.

Teaching, according to Richardson (2001), is an attempt to help people to acquire some skills, attitudes, knowledge, ideals and appreciation. In other word, the duty of a teacher is to create or influence acceptable behavioural changes in his/her own pupils or learners. The teacher in the course of teaching helps learners to acquire new knowledge, skills and acceptable values. Thus, the main purpose of teaching is to produce individuals that will be useful to themselves and the society by contributing to the growth and development of the nation.
Biology is one of the courses of study in science education curriculum and a core subject in senior secondary schools in Nigeria. Biology is important, not only for studying how living things work, but to benefit human beings. Biology education equips learners with the basic knowledge and skills that are essential in the study of medicine, pharmacy, Nursing, Brewing, Microbiology and other related disciplines.

Achievements in Biology over the years, just like other science subjects, have been poor. For example, the West African Examinations Council Annual Reports show that less than 50% of candidates passed Biology at credit level and above between 2000 and 2004 (Obamanu & Adaramola, 2011). BouJaoude and Barakat (2000) posited a reason for these poor achievements. According to them the teaching methods adopted by teachers do not make the learning of Biology easy for students’. Similarly, Oloyede (2010) identified that the method used by teachers of science contribute to students’ poor achievements in science subjects such as Biology. Francisco, Nicol & Tantman in BouJaoude and Attieh (2007) posited that prevailing teaching practices do not actively involve the learners in the learning process and seem to deprive the learners of taking charge of their learning, thus, affecting their performances in examinations.

Achievement in education is directly related to knowledge retention. Learners must retain knowledge acquired during teaching /learning process for them to achieve maximally in Biology. Kundu and Tutoo (2002) defined retention as a preservation of the mind. Materials in the mind should be preserved in form of images for knowledge to develop. Gatlin (1998) reported that for knowledge to be retained for a long time by the learners the teachers must use effective instructional techniques in the classroom. According to him effective instructional technique is one which encourages students’ active participation in the teaching/learning process. Gatlin went further to report that students’ who received the constructivist approach have a higher retention over-time than those who received lecture method. Gatlin (1998) concluded that poor retention of materials by student’s have contributed enormously to their poor achievements in science subjects like Biology, Physics, chemistry and agricultural science. He continued by saying that retention of materials in science depends so much on the instructional techniques employed by teachers of science in the classroom. In this study attempt will be made to ascertain the effect of concept mapping instructional technique on retention in Biology

Concept mapping is one of the newest instructional approaches developed by Novak. It is a process of organizing information or knowledge in form of maps as two-dimensional diagram that consists of concepts or nodes linked by labeled lines to
Effect of Concept Mapping Instructional Strategy on Students Retention in Biology

show relationships between and among those concepts. According to Novak (1990) concept mapping makes learning easier and easily understandable.

Lecture method remains one of the popular methods of teaching Biology in Nigerian secondary schools. Most teachers of Biology widely adopt lecture method because it provides for an effective use of time and manpower. It enables teachers to present many ideas to a large group in a relatively short period of time. However, according to Bimbola and Daniel (2010), lecture method makes learners passive in the teaching/learning process.

Purpose of the Study
The purpose of the study was to ascertain the effect of concept mapping instructional strategy on student’s retention in Biology. Specifically, the study intended to determine the effect of concept mapping instructional strategy and lecture method on student’s retention in Biology.

Research Question
What are the mean retention scores of students taught Biology with concept mapping instructional strategy and those taught with lecture method?

Hypothesis
Null Hypothesis (Ho): There is no significant difference between the mean retention scores of students taught Biology with concept mapping instructional strategy and those taught with lecture method.

Methodology
Design of the Study
The design adopted for the study was quasi-experimental design. Specifically, non-randomized control group pretest-posttest design was used for the study. The quasi-experimental design was used because the participants were not randomly drawn and assigned to experimental and control groups, rather intact class were randomly selected.

Area of Study
The study was carried out in Enugu educational zone, Enugu State, Nigeria.

Population of the Study
The population of the study was all the senior secondary school two (SSII) students offering Biology in Enugu educational zone, Enugu state, Nigeria.
Sample and Sampling Technique
The sample for the study was one-hundred and nine senior secondary two students drawn from two secondary schools randomly selected from Enugu educational zone, Enugu state, Nigeria.

Instrument for Data Collection
The instrument that was used for data collection was tagged Biology Retention Test (BRT). BRT Comprised of forty-item multiple-choice questions developed from the contents of lessons on photosynthesis and cellular respiration. Each item in the multiple-choice test was accompanied with four answer options from which the participants made their choices.

Instrument Validation
The instrument, Biology Retention Test, (BRT) was validation by two experts in Biology education and measurement and evaluation in order to determine its effectiveness in measuring what it was expected to measure. Criticisms and comments made by the experts were considered in producing the final copy of the instrument that was used for the study.

Reliability of Instruments
The research instrument used was trial-tested by administering the instrument to 54 senior secondary school two students’. By Kuder-Richardson formular (KR-20) the reliability coefficient of BRT was calculated to be 0.77. The choice of KR-20 is because it is most suitable for items scored dichotomously.

Method of Data Collection
Concept mapping and lecture instructional strategies were used as treatment in the study. The participants in the randomly selected intact classes in the randomly selected secondary schools were by default categorized and assigned into experimental and control groups. The experimental groups were taught with concept mapping while the control groups were taught with lecture method. Biology teachers of senior secondary two in the selected secondary schools were used as the research assistants. They were pre-trained to acquaint them with the techniques of concept mapping as an instructional strategy and how to apply it in teaching. Before the commencement of treatment, the research assistants administered the pre-test (pre-BRT). This was done to ascertain the level of achievement of the participants in Biology. The researcher prepared the lesson plans that were used by the assistants to
ensure uniformity of content. Teaching lasted for four (4) weeks. Retention test (post test) was carried out two weeks after the end of teaching to determine the degree of retention of Biology materials by the participants for a period of time.

**Data Analysis Procedure**

The research question was answered using mean. Mean was used because it is the most reliable measure of central tendency. Analysis of covariance (ANCOVA) was used to test hypothesis at 0.05 confidence level. The use of ANCOVA was to correct errors due to initial differences in ability of the participants since intact classes were used. To reject or not to reject the null hypothesis the following decision rules were applied:

- 1. If Fcal > Ftab, reject Ho
- 2. If Fcal < Ftab, do not reject Ho

**Result**

Research question I: What are the mean retention scores of students taught Biology with concept mapping instructional strategy and those taught with lecture method?

**Table 1: Mean Retention Scores of Students Taught Biology With Concept Mapping Instructional Strategy and Those Taught With Lecture Method**

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test Mean</th>
<th>Post-test Mean</th>
<th>No of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>11.10</td>
<td>17.70</td>
<td>55</td>
</tr>
<tr>
<td>Control</td>
<td>12.40</td>
<td>16.79</td>
<td>54</td>
</tr>
</tbody>
</table>

Data in table 1 show that the students in the experimental group taught Biology with concept mapping instructional strategy had a mean retention score of 11.10 in the pre-test and a mean retention score of 17.70 in the post-test. Similarly, the students in the control group taught with lecture method obtained mean scores of 12.40 in the pre-test and 16.79 in the post test. Since the post-test scores of the two groups are higher than their pre-test scores, it implies that concept mapping and lecture method enhances retention in Biology. However, the post-test mean score of the experimental group is higher than post-test mean score of the control group which implies that concept mapping instructional strategy is efficient in enhancing retention in Biology than lecture method.
Test of Hypothesis
Null Hypothesis (Ho): There is no significant difference between the mean retention scores of students’ taught Biology with concept mapping instructional strategy and those taught with lecture method.

Table 2:
Analysis of Covariance Result of Mean Retention Scores of Students Taught Biology with Concept Mapping Instructional Strategy and Lecture Method

<table>
<thead>
<tr>
<th>Square of variation</th>
<th>Sum of squares</th>
<th>d f</th>
<th>Mean square</th>
<th>Fcal</th>
<th>P</th>
<th>Ftab</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted mean</td>
<td>241.86</td>
<td>1</td>
<td>24.86</td>
<td>11.82</td>
<td>0.05</td>
<td>3.95</td>
<td>Ho rejected</td>
</tr>
<tr>
<td>Error</td>
<td>2193.22</td>
<td>108</td>
<td>20.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2414.08</td>
<td>109</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is observable from table 2 that at 0.05 confidence level Fcal is 11.82, while Ftab is 3.95. Since Fcal is greater than Ftab, the null hypothesis was rejected. This implies that there is a significant difference between the mean retention scores of students taught Biology with concept mapping instructional strategy and those taught with lecture method.

Discussion
In table I it was shown that both the experimental group and the control group had post-test mean scores higher than the pre-test mean scores. This indicates that both concept mapping and lecture method influence students retention of Biology materials. However, it also shows that the experimental group obtained mean retention score higher than the mean retention score of the control group in the post-test. It follows that concept mapping instructional strategy is more efficacious in enhancing student’s retention of Biology materials than lecture method. This observation is in line with the observation of Inomesia (2003) that concept mapping aids students understanding and knowledge retention. Similarly, table 2 shows that Fcal is greater than Ftab, indicating that there is a significant difference between the mean retention scores of students taught with concept mapping instructional strategy and those taught with lecture method. This implies and concretizes the fact that
concept mapping instructional strategy is efficient in enhancing retention in Biology. This observation might be due to the fact that concept mapping encourages student’s active participation during teaching/learning process, which is not achieved by the use of lecture method.

**Conclusion**

In the study it was observed that concept mapping instructional strategy is more efficient than the traditional lecture method in enhancing and encouraging student’s retention of Biology materials. It, therefore, follows that concept mapping instructional strategy is a good instructional tool which can be employed by Biology teachers to improve student’s retention in Biology.

**Effect of Concept Mapping Instructional Strategy on Students Retention in Biology**

**Recommendations**

Based on the finding in the study, it is recommended that:

1. Teachers of Biology in secondary schools should adopt concept mapping as an instructional strategy since it encourages retention in Biology.

2. Teachers of Biology in secondary schools should encourage their students to learn the process of concept mapping as this would assist them to retain information about concepts and meanings in Biology, which would enhance their achievements in Biology.

**References**


