

The Effects of Concept Mapping Instructional Strategy on Students Achievement in Basic Science

Uzowulu Ogochukwu Maureen

Department of Integrated Science, Nwafor Orizu College of Education, Nsugbe

Email: ogo_uzowulu@yahoo.com

ABSTRACT

The purpose of the study is to determine the effects of concept mapping instructional strategy on students' achievement in Basic science. The design for the study was a quasi experimental design. Three research questions and two hypotheses were formulated. The sample for the study consisted of one hundred and ninety one (191) basic science students selected from four government owned secondary schools in Awka South Local Government Area of Anambra State. Two classes of male and female students were randomly assigned to serve as experimental group and the other two as control group. The validated instrument of Basic Science Achievement Test (BSAT) had a reliability coefficient of 0.97 using Pearson Product Moment Correlation Coefficient. The students were first pre-tested with BSAT. They were then given a post test after teaching them with concept mapping. The research questions were analyzed using the mean and standard deviation. The hypotheses were tested using Analysis of Covariance (ANCOVA). The findings revealed that concept mapping produced a significant achievement on students performance in Basic Science. Those male and female students taught with concept mapping achieved significantly higher than their counterparts who were taught using conventional method. It was recommended among others that Basic science teachers should use concept mapping instructional strategy to teach their students to enhance their academic performance. Conclusions, implications and suggestions were made.

Keywords: Basic Science, concept mapping and hypotheses

INTRODUCTION

In Nigeria today, the need for the inclusion of Basic Science in the school curriculum at the junior secondary school level has been justified by several reasons advanced by the proponents of the subjects.

A concept map is a visual representation of a topic that students can create using words, phrases, lines, arrows, space on the page and perhaps color to help organize their ideas, and show their understanding of an ideas, vocabulary term or essential question. [1] noted that concept mapping is one of such innovative teaching strategies. To improve in the teaching of basic science, efforts should be made by the basic science teachers to help students acquire meaningful learning by making the teaching of the subject exciting, purposeful and participatory. These calls for the use of innovative methods of lesson presentation by teachers that

could make students adequately assimilate and understand the concept taught.

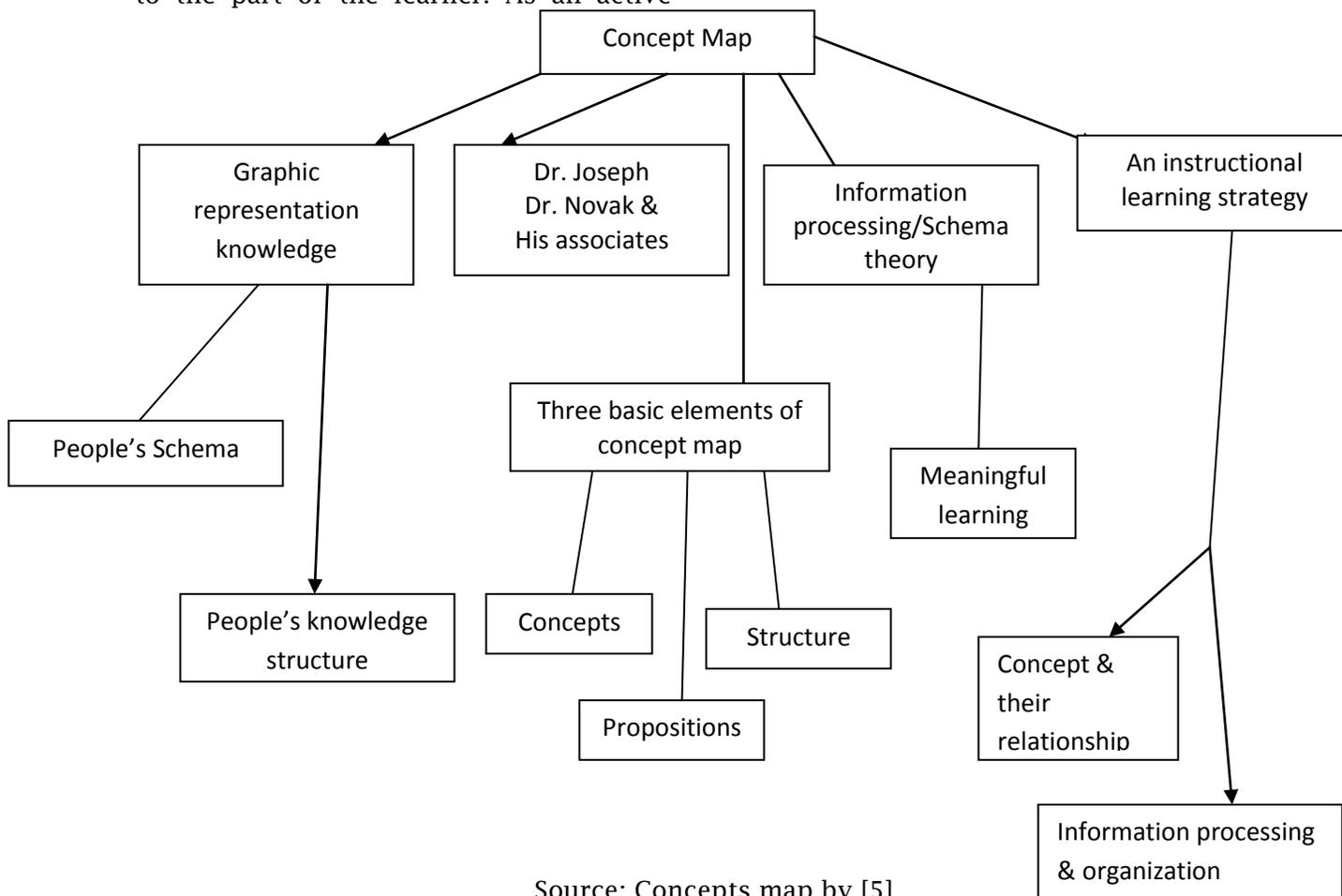
[2] defined concept mapping as a graphical arrangement of key concepts to show meaningful relationships among the concepts or ideas being studied. Concept mapping instructional strategy enables the teacher to select, organize and represent subject matters concisely. It enables students to take note easily, summarize and synthesize what they are reading and write reports. Complete concept maps represent a quick, at a glance, view of the concept or topic taught.

[3] in his study found concept mapping a key to organize an effective knowledge base. According to [4] concept mapping as a strategy in education is parallel with the movement from teacher to learner and as a result has the power to improve academic achievement.

Structuring and Construction

It is as a way of representing concepts hierarchically. The hierarchical orders of concept mapping, integrated as well as its explicitness makes concept mapping an approach that concretizes abstract knowledge. It requires an act we process to the part of the learner. As an active

based strategy, it enhances meaningful understanding of scientific concepts. It is therefore a process that enables an individual or a group to layout ideas in any topic in map form. It is a picture of some ideas about a topic or segment of a discipline.



Source: Concepts map by [5]

This instructional strategy, places more emphasis on the influence of students' prior knowledge on meaningful learning. Teaching is said to be effective especially if students achievement is enhanced.

Therefore, the researcher wants to find out if the achievement of basic science students can be enhanced by using concept mapping instructional strategy.

RESEARCH METHODOLOGY

Quasi experimental design was used for the study. The study was carried out in government owned secondary schools in Awka South Local government area of Anambra state. The sample consisted of one hundred and ninety-one (191) J. S. S 1 students selected from four secondary schools owned by government. The four schools were selected by simple random

sampling. The instrument used to collect data for this study was the Basic Science Achievement Test (BSAT). This consisted of 20 items which were used for pretest and post test. The pretest as used to establish the base line achievement of the students before the commencement of the treatment while post test was used to determine the effect of concept mapping

after the treatment. The items were validated by an expert in measurement and evaluation. The basic achievement test were administered to thirty (J.S.S 1) basic science students of a school in Onitsha North Local Government Area of Anambra State which was outside the area for the study. The students were not included in the mean study but they were equivalent to the group for which the test was developed after one month, the same test was administered again to those students. The test retest reliability coefficient was found to be 0.87 using Pearson Product Moment Correlation Coefficient. The instruments were administered by the researcher and basic

science teachers in the four schools. The students were first pretested with BSAT. Three days after the treatment, they were given a post test after four weeks of treatment using concept mapping instructional strategy. The time that was given for the BSAT was one hour, thirty minutes. The research questions were answered using the mean and standard deviation. The hypotheses were tested using analysis of co-variance (ANCOVA).

Presentation and Analysis Data

Research Question One

What are the performance levels of basic science students taught with concept mapping instructional strategy and those taught with conventional method?

Table 1: Post test mean scores and standard deviation of student taught with concept mapping and those taught with conventional method

Teaching method	Mean	SD
Concept method	49.50	6.03
Conventional method	47.00	4.33

Result in table 1 shows that the mean score and standard deviation of students taught with concept mapping are 49.50 and 6.03 while the mean score and standard deviation of students taught conventional method are 47.00 ad 4.33.

Research question two

What are the mean achievement scores of male and female basic science students who are taught with concept mapping and those taught using conventional method

Table 2: The mean and standard deviation male and female students taught with concept mapping and those taught using conventional method.

Sex	Teaching method	Mean	SD
	Concept Mapping		
	A	19.5333	6.5669
	B	15.5909	5.0300
	Total	17.1892	5.9481
	Conventional method		
	A	10.7407	3.6752
B	11.5200	4.6915	
Total	11.1154	4.1711	
Female	Concept Mapping		
	C	15.5909	5.0300
	D	18.0307	4.9262
	Total	14.1154	7.1711
	Conventional method		
	C	22.1143	7.1577
D	11.5294	4.0018	
Total	13.7819	4.4051	

Results in table 2 shows that the mean score of male and female basic science students taught with concept mapping instructional strategy are 17.19 and 14.12 with standard deviation of 5.95 and 7.17 respectively while the male and female basic science students taught with conventional method have mean scores of 11.12 and 13.78 with standard deviation of 4.17 and 4.41 respectively. Those male

and female students taught with concept mapping performed better than those male and female students taught with conventional method.

Research question three

To what extent do the mean scores of high achievers differ from the mean scores of low achievers with respect to concept mapping instructional strategy.

Table 3: Pretest and post test scores of high and low achievers.

	High Achievers	Low Achievers
Mean	61.35	52.90
SD	14.04	12.39

Table 3 above shows that the mean scores of high achievers was 61.35 which is higher than the scores of low achievers which has mean scores of 52.9. These scores indicated that the two groups differ.

Hypotheses one

There is no significant difference in the mean achievement scores of basic science students taught with concept mapping instructional strategy and those taught with conventional method.

Table 4: Summary of ANCOVA of achievement test scores on concept mapping and conventional method.

Scores of variances between groups	Df	Sum of squares	Mean square	F-cal	F-crit	Dec.
	1	4692.12	4692.12	28.85	3.92	S
Within groups	126	2048.79	162.62			
Total	127	2518.91				

Table 4 shows that f-calculated is 28.85 while the f-critical at 0.05 is 3.92. Since the observed value is greater than the critical, the hypotheses rejected. Therefore there is a significant difference between the mean achievement scores of students taught with concept instructional strategy and those taught without conventional method.

Hypothesis two

There is no significant difference in the mean achievement scores of male and female students who are taught with concept mapping instructional strategy and those taught using conventional method.

Table 5: summary of ANCOVA of achievement scores due to gender

Scores of variances between groups	Df	Sum of squares	Mean square	F-cal	F-crit	Dec.
	1	186.75	186.75	1.31	4.00	S
Within groups	62	8849.26	142.73			
Total	63	9036.01				

The table above shows that f-cal is less than f-crit at 0.05. the hypothesis is there

accepted. There is no significant difference between the mean achievement

score of male and female students in basics science with respect to concept

mapping instructional strategy.

DISCUSSION AND FINDINGS

This study revealed that students taught using concept mapping achieved significantly better than students taught using conventional method. The higher achievement could be that concept mapping provides a visual image of concept under study in a tangle form which students can focus very easily and readily revise when necessary. Ability to enable the students makes a sense of interrelationship of science and acquires control over the subject matter. These understanding of interrelationships of concept motivate students by attempting to incorporate new meanings into the prior knowledge rather than simply

memorizing concepts [5]. The interaction effect of teaching method and gender on student's achievement in basic science. [6], found out that gender is a significant factor in achievement of students in physics. There are a variety of reasons why students especially at the secondary level, perceive science as difficult in comparison to other subject areas. [7] also point to misconceptions about science phenomena based by students also contributed to the difficult of certain basic science topics. Teacher factors such as strategies used to teach basic science, teacher attitude towards science teaching, teacher experience and qualification.

RECOMMENDATIONS

Based on the findings of the study the following recommendations were made:

1. The use of concept mapping instructional strategy in teaching difficult topics was found to enhance the achievement of students in basic science.
2. Teachers should acquaint themselves with the skills and

principles of concept mapping with a view of enhancing students achievement in basic science. Science teachers Association of Nigeria (STAN) and the government can organize seminars and workshops to help teachers in this direction.

REFERENCES

1. Behar, M & Polot, P. (2007). The Science topics perceived difficult by pupils of primary 6-8 classes diagnosing the problems and remedy solutions. Education sciences, theory and practice.
2. Ezekannagha (2009). Chemistry concept mapping A tool of teaching difficult concept in chemistry. 49th Annual conference proceedings of STAN 144-147.
3. Novak, J. N. & Gown, D. B. (1984). Learning how to learn, Cambridge university press (Cambridge).
4. Okekubola, P. A. (1999). An Examination of the potency of the concept mapping technique. Journal of research in science teaching.
5. Ossai, U. A. (2004). Attitude Biology Teacher's to Research and Research findings 45th STAN Annual Conference proceedings 135-149.
6. Pankratius, W. J. (1990). Building an organized knowledge base concept mapping and achievement in secondary school physics journal of research in science teaching 27(4), 315-333.
7. Peterson, A. R. & Synder, P. J. (2008). Using concept maps to teach social problems Columbus state community college.
8. Ukwungwu, J. O. (2006). A meter Analysis of gender difference in students performance in physics. Journal of STAN, 41, 1 & 2, 56-69.