Effects of Concept Mapping method on the Academic Performance of Agricultural Science in Senior Secondary Schools in Kaduna State

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Abstract

The study was carried out to determine the influence of concept mapping method on the academic performance of agricultural science students in senior secondary schools in Kaduna State. The study has 2 specific objectives, 2 research questions and 2 null hypotheses. The Research design adopted for this study is pre-test post-test quasi-experimental design. The population for this research comprised of all the 15620 SSII agricultural science students in the 2016/2017 academic session in all the government senior secondary schools in Kaduna State. Random Sampling technique was used in selecting both school and students. Eighty (80) SS II students were randomly selected using hat and draw technique. Forty (40) male and forty (40) female students were selected. Groups A formed the treatment groups (concept mapping method) while group B formed the control group taught using the traditional method. The instrument used for data collection was a multiple-choice test consisting of a 30-item Achievement Test in Agricultural Science (ATAS) which was developed by the researcher. Simple descriptive statistics (means and standard deviations) were used to answer all the research questions. Data collected was then subjected to t-test statistics to determine students' academic performance under concept mapping method. All null hypotheses were tested at 5% level of significance. Result indicated that, students taught using concept mapping method performed better than students taught using the conventional lecture method. Male students were found to perform better than their female counterparts in the concept mapping method. Concept mapping method should be adopted by agricultural science teachers as it enhances students' academic performance. Government should equip the schools with the necessary equipment and materials needed by teachers for effective utilization of concept mapping teaching method. Teachers should creative and use their initiative one using concept mapping method for better understanding by students and better academic performance.

Introduction

Teachers are always looking for innovative ways and instructional methods to help students improve their outcomes in subject matter. Learning is a purposeful, conscious and complex process (Ahmad, *et ál*, 2013). An important feature of learning is that it involves a complex interactive system including environmental,

social, motivational, emotional and cognitive factors (& Byrne, 2003; Huffman, 2004; Joyce, Weil &Calhoun, 2004 as cited in Ahmad, *et ál*, 2013).Various teaching-learning strategies have been developed to accelerate learning process of students. Learning strategies evolve from the learning theories defining the role of teacher, students and the contents. In Nigeria, at present, mostly behavioural practices are in vogue in schools where students are passive and classroom environment is mostly teacher dominated (Emaiku, 2013).The effect of teaching methods on students' performance is receiving considerable attention from educators and researchers worldwide. What students learn is greatly influenced by how they are taught (Abdulhamid, 2013). Instructors teaching agricultural science have implemented a wide variety of teaching methods that fit different niches within the agricultural classroom. According to Emaikwu (2012), there has been drastic reduction in the standard of students' performance at all levels of education in Nigeria in the past decades. The fall in the standard of education is traceable to many factors which are rooted in psychological and environmental factors. This fall in standard of performance at secondary level is incontrovertibly attributable to instructional methods adopted by teachers in schools. Squeira (2012) stresses that learning through some methods is passive rather than active. Educators and researchers have repeatedly acknowledged the drawbacks of teaching with a strict lecture format.

Teaching methods according to Hassan (2002) are the approaches, ways and strategies that a teacher adopts in conducting his lesson to a successful end. Mamman (2002) also defines teaching methods as the ways of teaching which involve a series of teacher directed activities that result into pupils' learning. Teaching methods comprise of principles and strategies used for instruction (Daluba, 2013). Teaching methods are the tools of the teacher for reaching the set goals and objectives.

A concept map is a type of graphic organizer used to help students organize and represent knowledge of a subject. Concept maps begin with a main idea (or concept) and then branch out to show how that main idea can be broken down into specific topics. Concept maps are typically hierarchical, with the subordinate concepts stemming from the main concept or idea. This type of graphic organizer however, always allows change and new concepts to be added. They include concepts**,** usually enclosed in circles or boxes of some type, and relationships between concepts indicated by a connecting line linking two concepts. According to Ahmed (2010), a concept map is a diagram showing the relationships among concepts. It is a graphical tool for organizing and representing knowledge. The concept map representation encodes propositions describing two or more concepts and their relationships, in implied natural language sentences. In educational settings, concept mapping exercises have been used to encourage students to

actively construct an understanding of concepts and relationships within domains of interest (Ahmad, 2013). It was designed to support the learner's effort by externalizing concepts and propositions known to the student, making them visually apparent to facilitate their connection with newly acquired concepts. Concept maps have been used by teachers to assess students' understanding, by students to compare their knowledge and collaboratively renew their understanding, and by experts as a vehicle for modeling and sharing their knowledge. When created correctly and thoroughly, concept mapping is a powerful way for students to reach high levels of cognitive performance. John (2015) opined that, a concept map is also not just a learning tool, but an ideal evaluation tool for educators measuring the growth of and assessing student learning. As students create concept maps, they reiterate ideas using their own words and help identify incorrect ideas and concepts; educators are able to see what students do not understand, providing an accurate, objective way to evaluate areas in which students do not yet grasp concepts fully. Concept mapping is a valuable visual learning and thinking technique that helps students understand and communicate a concept and its connections between examples and ideas. John (2015) added that, concept mapping is a valuable theory of learning that teachers can use to evaluate a student's level of understanding. A concept map is meant to be constantly changed, added to and reconstructed as new information and knowledge is learned (which is why it's usually easier to concept map using a computer); the goal is to have the student be able to explain each part of the concept map and their reasoning behind the concepts and connections they made.

Students' academic performance refers to students' achievement in the topic taught base on the stated objectives. The use of appropriate teaching method by the teacher helps to achieve this goal. Edinyang (2012) defines academic performance as the outcome of education which reveals the extent to which a student, teacher or institution have achieved their educational goals. Academic performance or achievement is commonly measured by examinations or continuous assessment (Abdulhamid, 2013). Considering the central role played by agriculture in the Nigerian economy, it is necessary to identify and apply teaching methods most appropriate for the subject in senior secondary schools. This is because, according to Daluba (2013), the objectives of agricultural science in secondary schools can only be attainable through effective instruction and motivation of students by agricultural science teachers. Abdulhamid (2013) also maintains that, for effective teaching to take place, the teacher must stimulate, encourage and maintain active participation of the students through the selection of appropriate teaching methods. This would require a balance between what is taught and how it is taught. Thus successful teaching of agricultural science does not depend only on the teacher's mastery of the subject matter but also the teaching method employed.

Statement of the Problem

The poor academic performance of students in agricultural science in both internal and external examinations has assumed a dangerous dimension. In light of this, agricultural science educators need to seek suitable ways of tackling the current mass failure if they are to halt the drifts of students to arts and social science subjects (Adekoya, 2011). Time has come when young men and women should learn in school how to maintain and improve the fertility of the soil, how to increase the yield of an economic plant and how to raise domesticated animals on a more economic basis. This is imperative because, school boys receiving lessons on agricultural science today will be the scientific farmers of the future. It is therefore the work of agricultural science teachers to teach students the scientific principles underlying the field of agriculture. According to Omotere *et al* (2011), meaningful learning of principles depends on the ability of the pupils to recognize their relevance and their applicability to appropriate situations and then to apply them correctly. More so, the transfer of principles is a complex mental operation which cannot be left to chance. What students learn is greatly influenced by how they are taught. Instructors teaching agricultural science curricula have implemented a wide variety of teaching methods which fit different niches within the agricultural classroom (Abdulhamid 2013). Some methods of teaching are completely out of phase with background and local environments of the learners. According to Abdulhamid (2013), organizing for effective teaching in agricultural science is centered on certain factors such as what to teach, when to teach and how to teach. The teacher does not only teach the most relevant, meaningful and useful materials for specific students, he must also recognize and adopt a good and well-researched method of teaching that guarantees better understanding and also stimulates and motivates the students.

Therefore, this study set out to investigate if the use of concept mapping method could yield a better performance of both male and female agricultural science students in senior secondary schools.

Objectives of the Study

The major objective of the study is to determine the effects of concept mapping method on students' academic performance in agricultural science in senior secondary schools in Kaduna State. Specifically, the study intends to:-
Determine the difference in the academic performance of agricultural Science students taught using concept mapping method and those in   the control group
Determine the difference in the academic performance of male and female Agricultural Science students taught using concept mapping method

Research Questions

What is the difference in the academic performance of agricultural Science students taught using concept mapping method and those in   the control group? What is the difference in the academic performance of male and female Agricultural Science students taught using concept mapping method?

Null Hypotheses

there is no significant difference in the academic performance of Agricultural Science students taught using concept mapping method and those in the control group
there is no significant difference in the academic performance of male and female Agricultural Science students taught using concept mapping method

Research Methodology

Research Design

The Research design adopted for this study is pre-test post-test quasi-experimental design. This design was suitable for this research as it allowed the researcher to collect data on students' academic performance under the concept mapping method and the control group. To apply this design, the researcher gave the pre-test to students to determine their initial equivalence in all relevant aspects of the topic (Sheep and Goat Management systems) before exposing them to the treatment variables (concept mapping Method) after which post-test was taken.

The population for this research comprised of all the 15620 SSII agricultural science students in the 2016/2017 academic session in all the government senior secondary schools in Kaduna State. Random Sampling technique was used in selecting both school and students. One school was selected randomly from all the senior secondary schools in Kaduna State. One school was picked randomly by the researcher which served as sample school for the study. Eighty (80) SS II students were randomly selected using hat and draw technique. Forty (40) male and forty (40) female students were selected. Groups A formed the treatment groups (concept mapping method) while group B formed the control group taught using the traditional method.

The instrument used for data collection was a multiple-choice test consisting of a 30-item Achievement Test in Agricultural Science (ATAS) which was developed by the researcher. This is in line with Edinyang (2012) and Abdulhamid and Daluba (2013) who all adopted the same instrument in their studies. The test items

were selected from livestock management system (sheep and goat). Each of the items had five (5) options, A-E. All instruments were pilot tested and were adjusted before administration.

Data collection phase lasted for three weeks. Students were divided into two (2) groups; namely group A and B. Group A students formed the experimental group and were taught using concept mapping method. Group B formed the control group and were taught using traditional method. However, pre-test was given for both the treatment (group A) and the control (group B) group to test their initial equivalence before exposing group A to the treatment variable (concept mapping method). After the experiment, post-test was administered for both the treatment and the control groups. The exercise lasted for three weeks

Simple descriptive statistics (means and standard deviations) were used to answer all the research questions. Data collected was then subjected to t-test statistics to determine students' academic performance under concept mapping method. All null hypotheses were tested at 5% level of significance.

Answers to Research Questions

Research Question One: *What is the difference in the academic performance of agricultural Science students taught using concept mapping method and those in the control group?*

Table 1:   Difference in the academic performance of agricultural Science students taught
using concept mapping method and those in the control group

Group	N	SD	X	Grade
Concept Mapp.	40	2.312	67	B
Control Group	40	2.503	48	D

Result in Table 1 above indicated that, students taught using concept mapping method performed better than students in the control group who were taught using traditional lecture method. The mean score of students in the concept mapping method is 67 which is greater than the mean score of students in the control group (48). The mean grade of students in the concept mapping method is 'B' while that of students in the control group is 'D'. This implies that, concept mapping method leads to better students' academic performance in agricultural science in senior secondary schools.

Research Question two: *What is the difference in the academic performance of male and female Agricultural Science students taught using concept mapping method?*

Table 2: **Difference in the academic performance of male and female Agricultural Science students taught using concept mapping method**

Group	N	SD	X	Grade
Males	20	1.902	68	B
Females	20	2.021	65	B

Table 2 presents the result of male and female students taught using concept, mapping method. The result revealed that, male students performed better than their female counterparts when exposed to concept mapping method. The mean score of male students is 68 while that of their female counterparts is 65 indicating that, male students performed better than their female counterparts. However, mean grade of male students is 'B' while that of female students is also 'B' indicating that, the difference in the academic performance of male and female agricultural science students taught using concept mapping method is not much.

Test of Null Hypotheses

Null Hypothesis One: *there is no significant difference in the academic performance of Agricultural Science students taught using concept mapping method and those in the control group*

Table 3: **t-test analysis of the difference in the academic performance of agricultural Science students taught using concept mapping method and those in the control group**

Group	N	X	DF	t-cal.	t-crit.	Decision
Concept Mapp.	40	67				
			78	3.21	1.9	rejected
Control Group	40	48				

The t-test analysis of the difference in the academic performance of agricultural science students taught using concept mapping method and those in the control group as presented in Table 3 indicated that, t-calculated (3.21) is greater than t-critical at the degree of freedom of 78 and at 5% level of significance. This implies that, there significant difference in the academic performance of Agricultural Science students taught using concept mapping method and those in

the control group. Therefore, the null hypothesis which states that, there is no significant difference in the academic performance of agricultural Science students taught using concept mapping method and those in the control group was rejected.

Null Hypothesis two: *there is no significant difference in the academic performance of male and female Agricultural Science students taught using concept mapping method.*

Table 4: **t-test analysis of the difference in the academic performance of male and female Agricultural Science students taught using concept mapping method**

Group	N	X	DF	t-cal.	t-crit.	Decision
Males	20	68				
			38	1.82	2.0	retained
Females	20	65				

Table 4 presents the t-test analysis of the difference in the academic performance of male and female Agricultural Science students taught using concept mapping method. The Table revealed that, t-calculated (1.82) was less than t-critical (2.0) at the degree of freedom of 38 and 5% level of significance. This implies that, there is no significant difference in the academic performance of male and female Agricultural Science students taught using concept mapping method. Therefore, the null hypothesis which states that, there is no significant difference in the academic performance of male and female Agricultural Science students taught using concept mapping method was retained.

Summary of Findings

The major findings of this study can be summarized as follows:

Students taught using concept mapping method performed better than students taught using the conventional lecture method. The difference was found to be significant at 5% level of significance.
Male students were found to perform better than their female counterparts in the concept mapping method. However, the difference in the performance of male and female students in the concept mapping method was not significant at 5% level of significance.

Conclusion

Base on the findings of this research work, the researcher concluded that:

Concept mapping method has significant influence on the academic performance of agricultural science students in senior secondary schools in Kaduna State.
There is no significant difference in the academic performances of male and female agricultural science students in the concept mapping method.

Recommendations

Base on the findings of this study, it was recommended among other things that:
Concept mapping method should be adopted by agricultural science teachers as it enhances students' academic performance.
Government should equip the schools with the necessary equipment and materials needed by teachers for effective utilization of concept mapping teaching method.
Teachers should creative and use their initiative one using concept mapping method for better understanding by students and better academic performance**.**

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