

EFFECT OF CONCEPT MAPPING STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN GEOGRAPHY IN TARABA STATE, NIGERIA

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Abstract

The study investigated the 'Effect of Concept Mapping Teaching Strategy on Senior Secondary School Geography Students' Academic Achievement in Taraba State, Nigeria'. The study specifically determined the effect of concept mapping and Lecture Method on Geography students' Academic Achievement in Taraba State. One research question was raised and one hypothesis was tested at 0.05 level of significance to guide the study. The experimental design of the study was quasi-experimental pretest posttest non-equivalent control group design which involved 87 SSII students from four purposively selected senior secondary schools in Taraba State. The instrument used for data collection was a cognitive test tagged Geography Concept Achievement Test (GCAT) adapted from WAEC past questions from 2014-2021. The instrument was content validated by three experts. The instrument was also tested for reliability, using KR-20 method. The reliability coefficient of 0.92 was obtained. The treatment lasted for six weeks. The data collected were analyzed using descriptive statistics for the research question, and Analysis of Covariance (ANCOVA) for the hypothesis. The result shows that there is significant difference in the academic achievement of students taught geography with concept mapping and Lecture Teaching Methods in favour of students taught with concept mapping [$F = 33.56$ (df 1, 86), $P < 0.05$]. The use of student-centered activity in teaching and learning geography should be encouraged. The result of this study clearly showed that concept mapping teaching strategy enhanced students' academic performance in geography. Symposium and workshops should be organized and made compulsory for practicing teachers to inculcate skills in organizing and implementing concept mapping strategy. Schools should organize workshops and seminars internally which will enable teachers and their students to share ideas on the skills of designing and implementation of concept mapping strategy.

Keywords: Concept Mapping, Students' Achievement, Geography, Nigeria

INTRODUCTION

Learning is a complex and systematic process, involving interplay between and interaction of cognitive, affective, and psychomotor domains (Baron & Byrne, 2003; Huffman, 2004; Joyce, Weil & Calhoun, 2004; Akbas & Gencturk, 2011). Over the years, with their roots in relevant educational theories, several teaching strategies have evolved, which propound active student-centered participation. Learning acquired through concept mapping is said to be meaningful, enabling the learner to relate newly acquired knowledge with previously learnt material. On the other hand, rote learning (which opposes meaningful learning) takes place when new knowledge is arbitrarily incorporated into the cognitive structure (Novak, 2015). It is seen that students who learn by rote are able to recall new information but cannot apply the knowledge in other situations. Therefore, to attain a meaningful learning process, the learner should be an architect of his/her own knowledge. This can only be achieved when instructors employ viable teaching methods that enhance interaction between learners' domains of learning in subjects such as geography.

Geography is a distinct and dynamic science that deals with the study of man and his physical environment (Ajayi, 2003). It helps young people to appreciate the value of their environment and its vast natural resources. As a subject, it is versatile, expressive, and intellectually stimulating, exhibiting a correlation with all other school subjects. Modern geography is a science of synthesis that seeks to understand the character of a place in terms of total integration of the various phenomena which characterize a place, as well as the interrelationships between places (Ajayi, 2003). Thus, the teaching and learning of the subject should involve realistic methods rather than the conventional teaching method mostly utilized in Nigerian classrooms. This may be a major factor militating against students' academic performance in the subject.

Wood and Gentile (2013) observed that geography teachers have traditionally used a wide range of teaching methods, but many of these have been shown to be relatively ineffective on students' ability to master and retain concepts. Learning through methods such as the lecture method is passive rather than active and does not foster critical and creative thinking (Tuna, 2015). According to Dhaaka (2012), teaching strategies within an overall student-centered pedagogy can be an effective way to boost students' academic performance, critical thinking, and problem-solving. Sakiyo and Jebson (2008) suggested that students' involvement in their learning provides adequate learning outcomes rather than teacher-centered methods.

Concept mapping is a technique of visually representing the structure of information, concepts, and their relationships. Research studies reflect that concept mapping can be used as a successful teaching-learning strategy from primary school to university level (Cheema & Mirza, 2013). According to Jacob, Joel, Linus, and Lazarus (2016), concept maps are means of developing logical thinking and study skills by revealing connections and helping learners see how individual ideas form a larger whole. It is a pedagogical and metacognitive tool designed to help students learn how to learn. The teaching strategy may be very

effective in enhancing meaningful learning, and this study will investigate its effect on geography students' academic achievement in Taraba State, Nigeria.

This study's findings are expected to provide empirical evidence that benefits geography teachers, students, teacher training institutions, curriculum planners, and educational administrators by helping teachers refine their methods, enhancing students' achievement, interest, retention, and interaction, and offering planners insights into concept mapping's cost-effectiveness. The research specifically examined the effect of concept mapping on Senior Secondary School II geography students in Taraba State, Nigeria, focusing on public secondary schools due to their similar curricula and conditions. The theoretical framework draws on Bruner's Discovery Learning (1960), which emphasizes problem-based discovery and active learner involvement, and Ausubel's Meaningful Learning (1968), which stresses linking new knowledge to prior knowledge—both supporting concept mapping as a tool that visualizes links between concepts and aids understanding. Academic achievement, defined as the measure of teaching and learning excellence through examinations and assessments, is contrasted with the lecture method, an outdated one-way communication approach that dominates geography teaching despite criticism for its passivity. Empirical studies from Kenya and Nigeria consistently show that concept mapping outperforms traditional methods in subjects like science, mathematics, genetics, chemistry, and geography, fostering better achievement and higher-order thinking. However, most prior research focused on other subjects or locations, making this study unique in investigating concept mapping's effectiveness specifically for geography achievement in Taraba State, Nigeria, thereby addressing the gap left by the prevalent lecture method and reinforcing the need for activity-oriented, student-centered strategies.

Statement of the Problem

Despite the importance of Geography, it has been observed that students generally perform poorly in the subject in Nigeria over the years, as shown by WAEC results 2018-2023. This problem of poor achievement has remained a source of concern to geography teachers, ministries of education, and other stakeholders. If the situation is not properly addressed, it will retard the geographical advancement of Nigeria at large, since the knowledge of geography is key to the development of both the individual citizen and society.

Therefore, to get a rapid solution to the problem of poor academic achievement, there is a need to look afresh into the methods of geography curriculum delivery at the secondary school level. The Lecture Method commonly used by geography teachers has not yielded the desired goal of meaningful learning and improved achievement. Thus, there is a need to explore teaching methods which are teacher-student based, such as concept mapping, in an attempt to enhance academic achievement in the subject. The problem of this study put in question form is therefore: "Will the application of concept mapping Teaching Methods improve secondary school students' academic achievement in geography in Taraba state?"

Purpose of the Study

The purpose of this study is to investigate the effects of Concept Mapping Teaching Strategy on Senior Secondary School Students' academic achievement in Geography. Specifically, the study determines:

1. The effect of concept mapping teaching strategy on Geography students' Academic Achievement in Taraba state.

Research Question

The following research question has been raised to be answered in this study:

1. What are the mean achievement scores of students taught geography with concept mapping method and those taught geography with Lecture Method?

Hypothesis

The following null hypothesis was formulated and will be tested at a 0.05 level of significance in this study:

H₀₁: There is no significant difference in the Academic Achievement of students taught geography with concept mapping and Lecture Teaching Methods.

Methodology

Research Design

This study employed a quasi-experimental design, specifically the pretest, posttest, non-equivalent, control group design (Cohen, Manion, & Morrison, 2007). This design is appropriate for the study because intact classes were used to avoid disruption of normal class lessons. The independent variable is teaching strategy (concept mapping and lecture method), while the dependent variable is students' achievement in geography. The research design layout is:



O₁ represents the pretests for groups 1 and 2 respectively; O₂ represents the post-test for groups 1, and 2 respectively; X₁ represents treatment for the experimental group one and C represents treatment for control group.

Area of Study

The study was conducted in Jalingo Education Zone of Taraba State. The zone comprises Jalingo, Ardo Kola, and Lau Local Government Areas. The choice of Jalingo Education Zone is because it is one of the largest education zones in the state in terms of number of schools and populations of students, offering the researcher the opportunity to draw a representative sample.

Population

The population for this study consisted of all senior secondary school two (SSII) students offering geography in the government grant-aided secondary schools during the 2022/2023 academic session in Jalingo Education Zone of Taraba State, totaling 2,646 students.

Sample and Sampling Technique

The sample consisted of intact classes in selected secondary schools within the study area. A multistage sampling technique was used. First, Jalingo Education Zone was purposively selected from the nine education zones in Taraba State. Second, two local government areas (Jalingo and Ardo Kola) were selected out of three. Third, four schools (two from each selected LGA) were purposively selected to take part in the study. The selected schools were randomly assigned to two groups: Group A (Concept mapping) and Group B (Lecture method). The sample size comprised 42 students for the experimental group and 45 for the control group, totaling 87 students.

Research Instrument

Two instruments were used for the study:

1. **Geography Concepts Achievement Test (GCAT):** A 30-item multiple-choice test developed by the researcher to measure students' achievement on the units covered. The test was validated by three experts and its reliability was determined using Kuder-Richardson formula-20 (KR-20), yielding a reliability coefficient of 0.92.

Procedure for Data Collection

The procedure followed stages including: presenting an introductory letter to schools, training research assistants, administering the pre-test to both groups, teaching the topics for three weeks, and administering the post-test to both groups.

Method of Data Analysis

Data collected for the study was analyzed using descriptive statistics (mean and standard deviation) to answer the research question, and inferential statistics of Analysis of Covariance (ANCOVA) was used to test the research hypothesis at a 0.05 level of significance. ANCOVA was used to take care of initial group differences statistically.

Results and Discussion

Data Analysis

Research Question 1: *What are the mean achievement scores of students taught geography with concept mapping method and those taught geography with Lecture Method?*

Table 1: Mean and Standard Deviation of achievement scores of students taught geography with concept mapping and lecture method.

Teaching Strategies	N	Pretest Mean	SD	Posttest Mean	SD
Lecture Method	42	24.00	15.38	42.28	14.88
Concept Mapping Strategy	45	23.28	14.87	60.48	15.68

The descriptive statistics in Table 1 show that the concept mapping strategy group had a pretest mean score of 23.28 and a posttest mean score of 60.48, while the lecture method group had a pretest mean score of 24.00 and a posttest mean score of 42.28. Students taught with concept mapping strategy scored significantly higher than students taught with lecture method.

Hypothesis Testing

H₀₁: *There is no significant difference in the Academic Achievement scores of students taught geography with concept mapping and Lecture Teaching Methods.*

Table 2: ANCOVA table of Academic Achievement scores of students taught geography with concept mapping and Lecture Teaching Methods.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8707.021 ^a	2	4353.511	19.873	.000	.321
Intercept	49848.389	1	49848.389	227.554	.000	.730
PRETEST	1508.607	1	1508.607	6.887	.010	.076
TEACHING_STRATEGIES	7351.781	1	7351.781	33.560	.000	.285
Error	18401.208	84	219.062			
Total	259660.000	87				
Corrected Total	27108.230	86				

a. R Squared = .321 (Adjusted R Squared = .305)

The results of the analysis in Table 2 show that there is a significant difference in the academic achievement of students taught geography with concept mapping and lecture teaching methods [F (1, 86) = 33.56, P = 0.00]. Since the computed p-value (0.00) is less than 0.05 level of significance, the null hypothesis of no significant difference is rejected. This indicates that there is a significant difference in the academic achievement of students taught geography with concept mapping and lecture teaching methods

in favour of concept mapping strategy. The partial eta of 0.285 indicates that 28.5% of students' academic performance in this study was as a result of the concept mapping strategy.

Summary of the Results

1. There is a significant difference in the academic achievement of students taught geography with concept mapping and Lecture Teaching Methods in favour of students taught with concept mapping [$F = 33.56$ (df 1, 86), $P = 0.00$].

Discussion of Findings

The finding of the study revealed a significant difference in the academic achievement of students taught geography with concept mapping and lecture teaching methods. This finding concurs with that of Qarareh (2010), who investigated the effect of using concept mapping strategy in teaching on the achievement of fifth graders in science in Kenya. The study revealed that using concept maps showed a greater effect on academic achievement. Similarly, Adeneye (2011) found that concept mapping is an effective strategy for teaching and learning mathematics. Jibrin and Zayum (2012) also found that students taught genetics using concept mapped instructional strategy achieved higher than those taught using expository method.

The finding is also consistent with Okonkwo (2012), who found that concept mapping and simulation-game instructional strategies significantly enhanced students' achievement and interest in chemistry. Jack (2013) also found a significant difference between the performance of students exposed to concept mapping and the control group, in favor of concept mapping. Furthermore, Ukpai, Gabriel, Okechukwu, and Ugama (2016) showed that concept mapping fosters students' achievement in basic science more than the conventional method.

This consistent finding across multiple studies and subjects strongly supports the effectiveness of concept mapping as a teaching strategy. The superiority of concept mapping can be attributed to its ability to promote meaningful learning, as explained by Ausubel's theory. By helping students visually organize information and connect new knowledge to prior knowledge, concept mapping enhances understanding and retention. This contrasts with the passive nature of the lecture method, where students are often recipients of information without actively processing it.

Conclusion

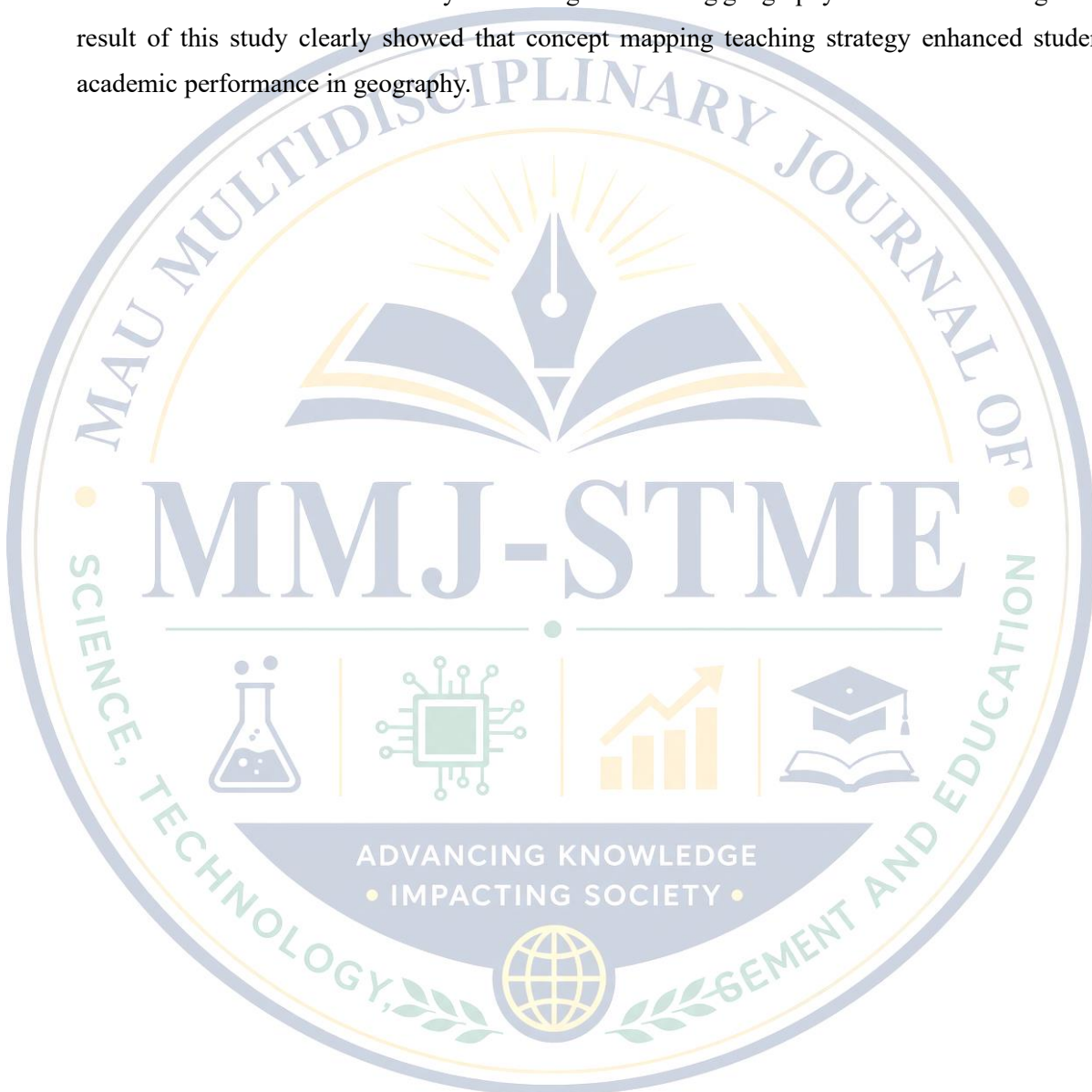
Based on the findings of the study, it is concluded that the concept mapping strategy enhances students' academic achievement in Geography. The strategy proved to be significantly more effective than the lecture method in improving students' performance. Therefore, it is concluded that the adoption of

concept mapping as a teaching strategy can be a viable solution to the problem of poor academic achievement in geography in Taraba State, Nigeria.

Recommendations

On the basis of results from this study, the following recommendations are made:

1. The use of student-centered activity in teaching and learning geography should be encouraged. The result of this study clearly showed that concept mapping teaching strategy enhanced students' academic performance in geography.



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