WORLD ATLAS INTERNATIONAL JOURNAL OF EDUCATION & MANAGEMENT
VOL 8 NO 1, OCTOBER 2025, NEW YORK CITY. *ISSN: 2667-1069*

EFFECT OF CONCEPT MAPPING AND MIND MAPPING ON STUDENTS' ACADEMIC PERFORMANCE IN BASIC SCIENCE AND TECHNOLOGY IN IKONO LOCAL GOVERNMENT AREA

By

ARCHIBONG, A. U., Ph.D.
Department of Integrated Science, College of Education, Afaha Nsit,
(Affiliated to the University of Uyo, Nigeria)
P.M.B. 1019 Etinan,
Akwa Ibom State,
Nigeria.

ABSTRACT

The purpose of the study was to investigate the effect of concept mapping and mind mapping on the academic achievement of students in Basic Science and Technology in Ikono Local Government Area. Three (3) hypotheses were formulated to guide the study. A quasi experimental design was adopted for the study which had a total of three hundred (300) JSS2 Basic Science and Technology students purposively drawn from twelve (12) public secondary schools. The three schools were randomly assigned to groups of concept mapping, mind mapping and expository teaching strategies. A 20 item achievement test (BSTAT) was administered to respondents after four weeks of treatment on the topic, skeleton. Data generated were analyzed using t-test statistical tool, and results indicated that concept mapping and mind mapping strategies were superior to expository method of teaching science concepts.

KEYWORDS: Concept Mapping, Mind Mapping and Academic Performance

INTRODUCTION

Science has been acknowledged as the bedrock upon which the bulk of the present day technological breakthrough is built. This explains why nations including Nigeria are striving hard to develop scientifically and technologically in order to fit into this global system. Science provides knowledge while technology provides ways of using this knowledge to solve human challenges and meet the needs of man (Lane, 2015). As noted by Nneji, Oshodi, Akomolede, Olayemi, Uwaila, Tochi, Iweuno, Stanley, Badmus, Samson & Adenuga (2024) Science has made the world a global community or village. Science pervades all aspects of our lives. Science education has today provided a route towards popularizing science and technology in an attempt to present science and technology to learners in such a manner that foster proper understanding among them. (Nwanekezie and Arokoyu, 2016). It is widely and generally acknowledged that the gateway to the survival of a nation is through science education, science education is the study of the inter-relationships between science as a discipline and the application of educational principles to its understanding.

Science educators have in recent years attempted to proffer solutions towards demystifying science especially at the basic levels of education and these have promoted innovative and creative procedures and strategies towards better

understanding and performance among students of science (Archibong, 2014). And since science requires critical and reflective thinking capabilities, new innovative teaching strategies have been pushed forward as attempts to foster better interest among science learners, among which are concept mapping and mind mapping teaching strategies.

Mind mapping is a virtual technique used to structure, organize and link ideas or concepts (Akeem, 2021). In mind mapping a single concept is highlighted as a central concept from where branches radiate out to display related ideas, tasks, words, etc. Sambo & Sunday (2024) noted that identified lecture, concept mapping, demonstration, experimenting, use of analogues, use of advance organizers and co-operative learning in groups as examples of instructional strategy used for teaching sciences. It is a tool that can be used to condense vast amount of information into a compact and understandable format. Cognitive research reveals that individual minds work in a radial, non-linear manner, constantly making connections between ideas; which mind mapping taps into (Akeem, 2021).

In order to create a mind map, a point is created in the middle of the page with the central theme main idea from where outward directions are formed to create a growing diagram composed of keywords, phrases, concepts, facts and figures (Archibong and Udoaka, 2024). Mind mapping can be used for generating, visualizing, organizing, note taking, problem solving, decision making, revising and clarifying and topical issue. This strategy is used to 'brain storm' a topic and is a great teaching/learning strategy for students because it enables them to think creatively, solve problems, feel comfortable and think positively and efficiently (Almutavi, 2016).

Equally, concept mapping, a metacognitive strategy has been found to enhance achievement in science at secondary level. It is a technique through which information are provided for developing linkage between the concept and their relationships.

According to Baker (2018) concept mapping is often used in science subjects where the focus is initially on a topic or content from which difficult terminologies are taken and listed in systematic order. Next to that, these terminologies or vocabularies are linked with each other to generate meaningful information which are presented in the form of graphical representation.

According to Archibong (2005), in concept mapping, concept are arranged hierarchically with the general concept at the top of the hierarchy and lower concepts linked to them in order of relatedness by some considerations. A finished concept map is analogous to a road map with every concept depending on the others for meaning. Infact concept maps are based on Ausubel's assumption that the most important factor influencing learning is what the learner already knows (Ausubel, 1963). This strategy brings learners experience to bear in their new tasks even as it rekindles their critical thinking ability.

It is on the basis of the above that this study was carried out to investigate the effect of concept mapping and mind mapping on the academic performance of Basic Science and Technology students in Ikono Local Government Area of Akwa Ibom State.

STATEMENT OF THE PROBLEM

In spite of the critical role Basic Science and Technology plays as the basis for further Science and technology Studies (i.e in chemistry, physics, etc) the performances of students at the junior secondary school level of education has not improved significantly. Efforts by researchers on teachers' and students' variables, utilization of instructional materials, application of some teaching strategies, on their effects on students' performance at this level of education has produced only abyssal improvement (Onah, 2022).

It is on this note that the effects of teaching strategies of concept mapping and mind mapping were investigated to determine their levels of impact on Basic Science and Technology students in Ikono Local Government Area of Akwa Ibom State.

PURPOSE OF THE STUDY

The purpose of the study was to ascertain the effects of concept mapping and mind mapping on the academic performance of students in Ikono Local Government Area of Akwa Ibom State of Nigeria. Especially the study sought to determine the difference in the academic mean scores of students taught Basic Science and technology using concept mapping, lecture method and mind mapping teaching strategy.

STATEMENT OF HYPOTHESES

- There is no significant difference in the academic performance mean scores of students taught Basic Science and Technology using concept mapping teaching strategies and those taught using lecture method.
- There is no significant difference in the academic performance of Basic Science and Technology students exposed to mind mapping teaching strategy and lecture method in Ikono Local Government Area.
- There is no significant difference in the academic performance mean scores of students taught Basic Science and Technology using concept mapping teaching strategy and those taught using mind mapping teaching strategy.

RESEARCH METHOD

- The design of the study was quasi-experimental research design as intact classes were used during treatment.
- The study was conducted in Ikono Local Government Area in Akwa Ibom State, South-South Nigeria with headquarters in Ibiaku Ntop Okpo with a population of about 160,000 according to the 2006 population census.
- The population consisted of all JSS2 Basic Science and Technology students in the study area in the 2022/2023 academic session and there were about four thousand five hundred students (source: LEC 2023 statistics).
- The study sample consisted of three hundred Basic Science and Technology students purposively drawn from twelve (12) randomly selected secondary schools in Ikono Local Government Area. By balloting, hundred (100) students were selected from each of the three schools amounting to three hundred subjects.

- Instrument for data collection was a- 20 item multiple choice Basic Science and Technology Achievement Test (BSTAT) which comprised two sectors. Part A sought for personal information about the respondents while part B carried the achievement test, BSTAT. Each convert answer carried one (1) mark while wrong ones were scored zero (0).
- Validation of the instrument was done by educational experts in test and Measurement and integrated science lecturer. All the corrections were effected before administration.
- **Rehability of Instrument:** The validated instrument was further administered to forty (40) JSS2 students of Basic Science and technology outside the study area but with similar characteristics to the study area. Split half method was used for data computation while Pearson Product Moment Correlation Coefficient analysis showed a rehability coefficient of 0.95 at 0.05 alpha level of significance.
- **Administration of Instrument/Data Collection:** Class teachers taught and supervised the test administration, using concept mapping, mind mapping and expository methods of teaching. Subjects were taught the concept of SKELETON and lesson packages drawn for the three groups of two experimental and one control for two weeks before Basic Science and Technology Achievement Test (BSTAT) was administered to them. Data collected were subjected to data analysis.
- **Method of Data Analysis:** Data generated from the study were analyzed using dependent t-test statistical tools at 0.05 level of significance.

Analysis of Results

Hypothesis One

There is no significant difference in the academic performance mean scores of student taught Basic Science and Technology using concept mapping teaching strategy and those taught using lecture method.

Table Independent t-test analysis of Students' Performance scores taught using concept Mapping Strategy and those taught using lecture method

Variables	N	$\bar{X}$	SD	Df	t-cal	t-crit	Decision
Mean performance scores of students taught using concept mapping	100	13.66	4.71				
				198	3.85	1.96	Sig.
Mean performance scores of students taught using lecture method	100	11.15	2.00				

As shown ion Table 1, the calculated t-value of 3.85 is greater than the critical t-value of 1.96, indicating that the null hypothesis was rejected. Therefore there is a significant difference in the performance mean scores of students taught Basic Science and Technology using concept mapping and those taught using lecture method. Concept mapping method proved superior to lecture method.

Hypothesis Two

There is no significant difference in the performance mean scores of students taught Basic Science and Technology using mind mapping strategy and those taught using lecture method of teaching.

Table 2: Independent t-test analysis of Students' Performance scores taught using Mind Mapping and those taught using lecture method

Variables	N	$\bar{X}$	SD	Df	t-cal	t-crit	Decision
Mean performance scores of students taught using mind mapping	100	17.86	3.38				
				198	23.79	1.96	Sig.
Mean performance scores of students taught using lecture method	100	10.20	1.65				

Based on the result of t-test analysis on Table 2, it is observed that the t-calculated value of 23.79 is greater than the critical t-value of 1.96, thus the null hypothesis was rejected. This means that there is a significant difference in the performance mean scores of students taught Basic Science and Technology using mind mapping strategy and those taught using lecture method.

Hypothesis Three

There is no significant difference in the performance mean scores of students taught Basic Science and Technology using concept mapping and those taught using mind mapping strategies.

Table 3: Independent t-test Analysis of Students' Performance scores taught using concept Mapping Strategy and those taught using mind mapping

Variables	N	$\bar{X}$	SD	Df	t-cal	t-crit	Decision

Mean performance scores of students taught using concept mapping	100	17.00	12.19				
				198	2.86	1.96	Sig.
Mean performance scores of students taught using mind method	100	16.80	11.62				

From Table 3 above, the t-calculated value of 2.86 is greats than the t-critical value of 1.96 at 0.05 level of significance. Therefore the null hypothesis is rejected, which implies that there is a significant difference in the academic performance of Basic Science and Technology students exposed to concept mapping and mind mapping strategies. As reflected in their means scores, concept mapping is slightly superior to mind mapping in this study.

DISCUSSION OF FINDINGS

From Table 1, it was seen that student taught using concept mapping performed better than those taught using lecture method. This finding is in line with Phaman (2014) and Effiom (2020) who found out that concept mapping strategy promotes academic achievement in science. Again, Lawson (2021) in his study observed that concept mapping enhanced Basic Science and Technology students' achievement due to the active involvement in students in the learning process.

Table 2 revealed that students taught using mind mapping performed better than those taught using lecture method. The corroborates Bassey (2016) findings that mind mapping promotes concept mastery in Basic Science and Technology. Equally, Lawson (2021) is in support of the superiority of mind mapping strategy over lecture method due to its ability to enhance students' organization of thoughts.

In Table 3 it was observed that concept mapping strategy had a minor advantage over mind mapping strategy and both strategies encourage students' ability to visualize linkages of concepts which in turn helps to classify the concepts. Onah (2022) in his study discovered that mind mapping was equally a strategy in adopt in the teaching of Basic Science and Technology in secondary schools.

CONCLUSION

Based on the findings and discussion of this study, it was concluded that concept and mind mapping are effective instructional approaches which can enhance students' academic performance in Basic Science and Technology in our secondary schools. These approaches should be adopted by teachers of science.

REFERENCES

Archibong, A. U. (2005). Concept Mapping and practical objections integrated science series No. 3 STAN, pgs 52-56.

Almutari, J. (2016). Observation, meaning and theory: Review for and against methods. Book Review.

Akeem, R. S. (2021). Measurement: Rehability and validity strategies for Educational Inquiry http:/www.indiana.edu.

Ausubel, D. P. (1963). The use of advanced organizers in the Journal of Educational Psychology 51: 267-272.

Baker, H. I. (2018). An Investigation on Teaching. 10 (1); 36-44.

Effiom, T. (2020). Concept mapping method and students' performance in Biology in Secondary Schools in Ika Local Government Area. PhD Unpublished Thesis, UI.

Lane, M. L. (2015). Integrated Educational Technology for Trainees and Practicing Teachers, Pwat Press Kano 5-8p.

Nwanekezie, U. and Arokoyo, M. (2016). It's all in the Brain: Gender and achievement in Science and Technology Education, UNN- Inagural Lecture.

Onah, H. L. (2022). Use of concept mapping and lecture method in Enhancing Primary School pupils' Achievement in Social Studies, ILSHS 51 (3).

Sambo, D. D. & Sunday, B. E., (2024). Influence Of School Environmental Factors On Students Academic Achievement And Interest In Core Science Subjects In Uyo Senatorial Districts Of Akwa Ibom State, Nigeria. *International journal of advancement in education, management, Science and technology*, 7(1), 1-2.

Nneji, P. O. Oshodi, P. A. Akomolede, S. K. Olayemi, J. O. Oboite, D. U. Tochi, N. S. Iweuno, B. N. Stanley, N. E., Badmus, A. H., Samson, K. A., & Adenuga, A., (2024). The Impact of Practical Work Experience on Academic Achievement in Biology among Senior Secondary School Students in Yenagoa Metropolis. *Journal of Education, Society and Behavioural Science.* 37(5), 50-57.