

EFFECT OF CONCEPT-MAPPING ON STUDENTS' PERFORMANCE IN ENVIRONMENTAL EDUCATION-RELATED SECONDARY SCHOOL SUBJECTS IN ILORIN, NIGERIA

By

OKUNLOYE, R. W.

*Department of Social Sciences Education
University of Ilorin, Ilorin, Nigeria
rotiloye@yahoo.com/okunloye@unilorin.edu.ng*

And

ABDULSALAM, A. A.

*Department of Social Studies
Kwara State College of Education, Ilorin, Nigeria
alliyuabdulsalam@yahoo.com*

Abstract

This study investigated the effect of Concept -mapping as means of instruction in Social Studies. The study compared effects of concept–mapping and lecture methods of teaching on the performance of students in Environmental Education-Related (EE) component of secondary school Subject curriculum in Ilorin, Nigeria. The Study further examined the moderating influence of gender on the experimental group's performance in Social Studies. The study was a 2 x 2 non-randomized; control group pre-test, post –test quasi – experimental design. The study sample was drawn from co-educational schools with two intact classes, comprising 150 students. The instruments used were Concept-mapping Treatment Lesson Plan (CMPTLP) and Social Studies Performance Test (SSPT) made up of 20 multiple choice questions. Four hypotheses were generated and tested at 0.05 level of significance. The study revealed a significant difference in the performance of the experimental group exposed to concept-mapping who performed better than the control group exposed to lecture technique. Concept–mapping was therefore adjudged to be an effective instructional technique for enhancing learning and academic performance. It was therefore, recommended that teachers should be trained through the use of seminar, workshop on how to use concept–mapping to

enhance effective teaching of environmental education in cognate school subjects such as social studies, civic education, geography, agric science and biology in Nigerian junior and senior secondary schools.

Keywords: Effect, Concept-Mapping, Environmental Education, Students' Performance

Introduction

The degradation of the environment constitutes a threat to human survival and man has been responsible for this (Abdulsalam, 2008). Concerted efforts to arrest the environmental degradation did not start until about three decades ago. In 1972, the international community worked out a global sensitization and management strategy in Stockholm. This consequently, resulted in the establishment of the United Nations Environmental Programme (UNEP). This was followed by the Belgrade Charter in 1975 (Yusuf, 2002). The effort to include Environmental Education (EE) in the educational system came up after the Tbilisi Conference in 1976. One of the outcomes of the sensitization drive on EE was the convention of the "Rio De Jenairo Conference" The Earth Summit of 1992, known as gender 21 (Obayan, 1995) which further consolidated the drive towards the introduction of EE in the school system across the globe.

The national workshop on the integration of EE gave impetus to many research studies that emphasized the need for functional implementation of EE in Nigerian secondary school curriculum (Oduwaiye, 1997, Abdulsalam, 2008, and Ajitoni, 2011).

The protection of the environment is an essential part of development (Ajitoni, 2005). (Ajitoni, 2011), also argued that without adequate environmental protection the environment is undermined. Furthermore, he opine that without development, resources will be inadequate for needed investment environmental protection will fail. The achievement of sustained and equitable development has, thus, remained the greatest challenge, facing the human race (Ajitoni, 2011). Therefore, in order to achieve the acceptable level of global environmental sustainability, the citizens must be empowered with essential knowledge and information especially in developing country like Nigeria (Anna, 2005).

In an apparent rise to this challenge, Nigeria was among the countries that endorsed the concept of sustainable environmental development at the Earth summit in 1992. It was in response to or in support of this declaration and the preceding ones that some governments, including Nigeria, created or gave increased support to environmental protection agencies and the integration of EE into the school curriculum to reverse the trends that may lead to ecological disaster (Ajitoni, 2011).

Environmental Education (EE) refers to organized efforts to teach about

how natural environment function and how human beings can manage their behaviour and ecosystems in order to live sustainably in symbiotic relationship with their environment (Wikipedia, 2013). The term is often used to connote education within some designated academic subjects at basic and secondary levels including social studies, integrated science, biology, geography, agricultural science, among others. However, it is sometimes used more broadly to include all efforts to educate the public and other audiences, through the use of print materials, websites, media campaigns, etc. EE is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges and fosters attitudes, motivation and commitments to make informed decisions and take responsible action (UNESCO, Tbilisi Declaration, 1977).

There is a strong belief in the international scientific community that the application of science and technology helped in environmental problem solving and achieving sustainable development and global environmental sustainability (Miller Jr. & Spoolman, 2011). In addition, the progress towards sustainable development is dependent upon a fundamental change in societies' attitude to nature and the environment. It is only with such enlightenment that the affluent would be willing to adopt less consumptive life styles commensurate with the Earth's ecological capacity (Nath, 2003).

According to Mezieobi (2011), social studies is a reformatory school subject designed to equip learners with desirable attitudes, values, skills and knowledge for cohesive and constructive social existence in the Nigerian society. Hence, what is needed to bring about this change of attitude is education in moral and ethical philosophy and respect for moral values that are entrenched in social studies as a subject.

The use of conventional teaching method involving a predominantly 'chalk talk' technique of instruction as contributed to students' lack of proper understanding of the subject. Also use in the conventional teaching methods are other complementary techniques such as lecture, discussion, tutorial, debate, and storytelling (Abimbola, 2009). The quality of education received by the learners depends on the quality of the teachers, who according to Lassaa (1996), bring the curriculum to life in the classroom. He further stressed that the amount and quality of curricular experiences to which the learners are exposed, obviously depends on the effectiveness of teachers in managing the teaching- learning transaction. Hence the quality of education is equally linked to teachers' ability to effectively use other complementary innovated instructional strategies, such as, concept mapping and guided discovery for effective teaching and enhanced academic performance of students.

According to Agreement and Ontiretse (2011) the conception of citizenship education in Botswana is driven by social studies which is a subject taught from primary and secondary schools all the way to tertiary education. He reported that, there is deterioration in the performance of students in social studies and that there

is a disturbing decline of performance in most schools in social studies every year.

A concept map is a structural representation consisting of nodes and labeled lines. The nodes correspond to important terms (standing for concepts) in a domain (Anderson, 1984; Novak, 2000). The lines denote a relation between a pair of concepts (nodes) and the labels on the line tell how the two concepts are related. The combination of two nodes and a labeled line is called a proposition. Concepts are defined as “perceived regularities in events or objects or records of events or objects, designated by a label”. As stated by Novak (1990) “the meaning of any concept for a person would be represented by all the prepositional linkages.

Statement of the Problem

In Nigeria, many researchers (Abdullahi, 1982; Abdulsalam, 2011 & Oloyede, 2004) have reported about students' poor performance in secondary school subject. Furthermore, a careful look at the educational records of students' performance in both the external and internal examinations reveal a downward trend in students' academic performance (Adeoye, 2002; Adeniji, 2003; Yusuf, 2004; Abdulsalam, 2008; Adetayo, 2011). Other reports in social studies (Abdulsalam, 2008; Agreement & Ontiretse, 2011; Adetayo, 2011) revealed that there is a steady decline in students' performances over the years as a result of the methods of instructions used in schools, the predominantly used method in the secondary school is the traditional 'chalk and talk'/expository techniques of instruction. In recent years emphasis on the importance of active, meaningful and effective learning in schools is being stressed, such as, innovative activity – based strategies that engage students in hands-on and minds – on activities like guided – discovery, concept-mapping, conceptual change and semantic networking, etc (Isiugo – Abanihe, 2004; Falaye, 2007; Akpan, 2008). Therefore, since these studies were conducted in the sciences, it is imperative to verify the generalisability of their findings in social studies which has substantial EE contents.

The main purpose of this study was to determine the effect of concept-mapping technique on students' performances in the EE concepts in social studies. It also examined the effect of conventional method of teaching on students' performance in the EE component of social studies. Also it examined the interactive effects of concept mapping and gender on students' performance in EE.

Methodology

The research was quasi-experimental group (concept mapping) and control group conventional method; pre-test and post-test scores. The study adopted a 2x2 factorial design in the matching of the variables.

This study was restricted to only JSS I students in two co-educational classes within Ilorin metropolis in Kwara State. It involved two intact classes, one for the experimental group and the other for the control group.

The choice of JSS I students was because of the treatment of environmental education concepts in this class. Two social studies classes, consisting of 150 Junior

Secondary I students participated in the study in the two purposively selected junior Secondary Schools. One served as the quasi-experimental group (taught using concept-mapping). The other served as the control group (taught using conventional method). The treatment lasted for three weeks of 80 minutes per lesson.

The target population of this study was Junior secondary schools social studies students in Kwara State. The sample was drawn from co-educational (public) schools in Ilorin metropolis to reflect composition of the target group in the quasi-experimental and control groups. The schools designated as quasi-experimental and control groups were accordingly purposively selected on the basis of the gender criterion identified. The research instruments were Concept–Mapping Treatment Lesson Plan (CMPTLP) and Social Studies Performance test (SSPT). The SSPT was a 20 item multiple choice questions. The test was based on environmental education topics as stipulated in the Nigerian Educational Research and Development Council (2007) developed syllabus of Junior Secondary School Social Studies. The key concepts treated in the CMPTLP include basic environmental concepts, such as environmental balance, environmental resources, water and air pollution, industrial waste disposal, flooding, deforestation and desertification.

The topics were broken-down to three (3) lessons. The lessons were taught for three weeks during the study. The two groups were pre-tested before treatment and post-tested after treatment. The answer scripts were scored and the data collected were subjected to t-test analysis to determine the effect of concept mapping and the interactive effect of treatment and gender on the quasi-experimental with reference four null hypotheses raised for this study. The four hypotheses were tested at 0.05 level of significance. These include:

H_{01} : There is no statistically significant difference between the performance of students exposed to concept mapping and those exposed to conventional method of instruction.

H_{02} : There is no statistically significant difference between performance of male and female students exposed to concept mapping technique.

H_{03} : There is no statistically significant difference between performance of male students exposed to concept mapping technique and those exposed to conventional method of instruction.

H_{04} : There is no statistically significant difference between performance of female students exposed to concept mapping and those exposed to conventional method of instruction.

Results

The summary t-test analysis of data and results with reference to the four null hypotheses are presented in tables 1, 2, 3, & 4 with comments.

H_{01} : *There is no statistically significant difference between the performance of students exposed to concept mapping and those exposed to conventional method of instruction*

Table 1: t-test analysis of performance of students exposed to concept-mapping and those exposed to conventional technique of instruction

Group	No of Students	Mean	SD	df	t-cal	t-table	Decision
Concept- mapping	81	64.87	9.74	148	6.45*	1.98	Rejected (S)
Conventional method	69	49.07	7.29				

*Significant, $p < 0.05$

In Table 1, the calculated value 6.45 is greater than the table value of 1.65 at 0.05 level of significance and 148 degree of freedom. The hypothesis is therefore rejected.

H_{02} : *There is no statistically significant difference between performance of male and female students exposed to concept mapping technique*

Table 2: t-test analysis of male and female students taught using concept-mapping technique

Group	No of students	Mean	SD	df	t-cal	t-table	Decision
Male	43	62.26	6.61	79	0.037	1.65	Accepted
Female	38	64.46	65.32				

Result in table 2, showed that the calculated value of 0.037 is less than the critical value of 1.65 therefore, the hypothesis is accepted.

H_{03} : *There is no statistically significant difference between the performance of male students exposed to concept-mapping technique and male students exposed to conventional method of instruction*

Table 3: t-test analysis of male students exposed to concept-mapping and conventional technique of instruction

Group	No of students	Mean	SD	df	t-cal	t-table	Decision
Concept-mapping (Male)	43	62.26	6.61	79	73.94*	1.65	Rejected (S)
Conventional method (Male)	38	48.95	6.79				

Source: Field Work, (2013)

The result in table 3 showed that the calculated t-value of 73.94 is greater than the

table value of 1.65 at 0.05 level of significance and 79 degree of freedom. Based on the result of data analysis, the null hypothesis is therefore rejected.

H₀₄: There is no statistically significant difference between performance of female students exposed to concept mapping and those exposed to conventional method of instruction

Table 4: t-test analysis of female students exposed to both concept- mapping and conventional technique of instruction

Group	No of students	Mean	SD	df	t-cal	t-table	Decision
Concept- mapping (Female)	38	64.46	65.32	67	2.00*	1.65	
Conventional method (Female)	31	49.19	7.86				Rejected (S)

*Significant, p<0.05

The result in Table 4 showed that the calculated t-value of 2.001 is greater than the table t-value of 1.56 at 0.05 significance level and 67 degree of freedom. The hypothesis is therefore rejected.

Discussion

The results in table 1, 3 and 4 revealed that there was significant difference in the performance of students taught using concept- mapping as compared to those students taught using conventional method of instruction.

These results also showed that students taught with concept mapping technique performed better than their counterparts taught with using the conventional technique of instruction. This suggests that the techniques/methods of instruction which students were exposed to contributed significantly to the differences in their performance. The superiority of the concept-mapping technique as shown in the post-test performance score was partly attributable to the enhanced ability of the students to see clearly the inter-relationship among EE concepts as earlier observed by Novak and Godwin (1984).

The result in table 2 supported the hypothesis that there is no statistically significant difference between the performance of male and female students taught using concept-mapping technique of instruction in social studies. The result indicated that female students exposed to concept mapping had a slightly higher mean score (64.46) than their male counterparts (62.26). These findings are indications of the efficacy of concept mapping in improving students' learning and academic performance in EE related school subjects, this is consistent with the findings of earlier studies on the effects of concept mapping as an instructional tool in science and mathematics (Novak, 1990a; Novak, 1990b).

The result also confirmed that there was a significant difference between the performance of male students, exposed to concept mapping as compared to those male students taught using the conventional method of instruction in social studies. Furthermore, the result in table 4 indicated that female students' mean score is higher in concept-mapping group had a higher mean score (64.46) than their counterparts who were taught using the conventional method (49.19).

This finding is consistent with the previous finding of Adeoye, (2002) which observed significant difference between the performance of female students that were exposed to conventional method of teaching in social studies.

Conclusion

From the analysis of data and results interpreted, it can be concluded that students taught using concept mapping significantly performed better than their counterparts exposed to the conventional method of instruction. Therefore, concept-mapping is a valid and functional instructional tool or teaching-learning activity for enhancing meaningful conceptual knowledge since concept-mapping involve students in higher other cognitive process for knowledge construction beyond mere recall and comprehension of set of contents under the conventional method.

Concept-mapping also enables students to receive individual attention denied them under conventional technique of instruction where the size of the class may not allow individual attention, especially in Nigeria under the prevailing high students-teacher ratio that is far in excess of the prescribed 40:1 (FRN, 2004) in public secondary schools. On the contrary, under concept-mapping, there is direct contact and interaction between the students and teachers. The students are also allowed to exhibit their talents and walk at their individual pace in concept mapping related concepts and by so doing, enabled to lay claim to knowledge constructed.

Recommendations

The findings of this study have implications for EE subject textbooks authors, publishers, teachers, professional association of teachers and curriculum development agencies.

EE textbook writers, publishers and service teacher should facilitate the use of concept-mapping in students' and teacher editions of EE-related textbooks by concept-mapping relevant chapter contents and including concept-mapping end of chapter revision exercises for students. Also, the apex curriculum development agency for basic and senior secondary curriculum – The Nigerian Educational Research and Development Council (NERDC) should revise the guidelines for implementing EE related basic and senior secondary subjects in their curriculum documents to include the use of concept-mapping as an instructional tool/technique to be used by teachers and students' learning activities.

On account of relative newness of concept-mapping in social science based EE subjects such as citizenship education, social studies and geography, the subject

teachers should be given skill acquisition training in concept-mapping technique for teaching and learning. In addition, EE teachers should be exposed to the use of advanced organizers in view of the strategic role of interrelated concepts in concept-mapping. It is hoped that these measures will go a long way to promote the use of concept mapping as a tool/technique for enhancing teaching and learning effectiveness in EE-related subjects in Nigeria basic and senior secondary schools.

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