

**EFFECT OF HARTMANS PROBLEM SOLVING STRATEGY ON  
ACHIEVEMENT AND ATTITUDE TO ENVIRONMENTAL  
EDUCATION IN SOCIAL STUDIES AMONG JUNIOR SECONDARY  
SCHOOL STUDENTS**

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**Abstract**

*The study investigated the effect of Hartman's problem solving strategy on achievement and attitude to environmental education in Social Studies among junior secondary school students. The study adopted a pre-test, post-test, control group quasi-experimental design with a 3x2x2 factorial matrix. Three intact classes of subjects were involved in the test administration before and after the experiment. The target population for this study consisted of all public Junior Secondary School (JSS) year two (JSSII) Social Studies students in Ogun State, Nigeria. The sample for the study consisted of one hundred and thirty-three (133) JSS Social Studies students in three intact classes and selected through a multi-stage sampling procedure in Ogun State. Two instruments were used for this study. These are Environmental Education Concept Achievement Test (EECAT) and Attitude to Environmental Education Questionnaire (ATEEQ). The treatment package is Teacher Instructional Guides (TIG). Data collected in the study were analyzed using the Statistical Package for Social Sciences (SPSS) version 18. The analysis involved descriptive statistics. The descriptive data were used to answer the research questions (using mean and standard deviation). Findings revealed that, Hartman's group strategy enhanced academic achievement on the concept of environmental education by 7.36 (posttest 23.70- pretest 16.34) than the conventional with mean 4.36(posttest 19.18 – pretest 14.82). Furthermore, Hartman's problem-solving strategy reduced negative attitude by -8.55 (43.02-51.57) more than the conventional strategy with mean loss of -3.55(52.95-56.50) respectively. However, the effectiveness of the two experimental groups are better compared to the control group. Therefore, the study recommended that, authors of textbooks, curricula and instructional materials on Environmental Education and Social Studies should provide additional information on Hartman's problem solving strategies for teachers and students to learn more about the application of problem-solving strategies.*

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**Keywords:** Hartman problem strategy, Education, Attitude, Environmental, Achievement

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## **Introduction**

Social studies is

the integration of knowledge, experience and effective use of resources for the purpose of citizenship effective (Barth & Shermis, 2013). Social Studies is expected to promote consciousness and knowledge of and pride in the child's local culture as well as an understanding of other cultures both within and outside their national boundary (Makinde, 1999). Social Studies lead to a well-informed and civic-minded citizenry that can sustain and build on democratic traditions (Enwelim, 2016). Environmental education is a process allows people or person to gain access and mastery of environmental issues as well as the best possible ways to proffer solution to them for the inhabitant of human and animals. The National Environmental Education Curriculum was developed by Nigerian Environmental Research and Development Council (NERDC) in the 1990s through which Environmental Education concepts and themes were built into school subjects at the primary and secondary levels (Ogunyemi, 2006). Subsequently, the Basic Education Curriculum for Social Studies (NERDC, 2007) introduced elements of Environmental Education into the school subject. This is not unexpected because there is a strong connection between Social Studies and Environmental Education (Ogunyemi, 2006). Thus, it has become expedient to teach Environmental Education through Social Studies in Nigeria. Ogunyemi (2006) further argued that it is urgent to use Social Studies as a conveyor subject for Environmental Education because Nigeria equally has its fair share of the current global environmental crisis. Evidence of this crisis includes the increasing desertification of the northern part of the country, widespread cases of illegal logging in the south, and occasional flood disaster in many parts of the country through which hundreds of lives are lost and property worth billions of naira are damaged (Ogunyemi & Ifegbesan, 2011).

This therefore necessitated a carefully designed educational courses in schools and colleges for an overall awareness of the public through the learning of basic strategies so as to ensure that generations will understand the value and importance of environmental issues like pollution control, resource conservation, desertification, flooding and wildlife habitat protection (Ogueri, 2004). Yardwell (2004) and Ogunbiyi (2006) argued that Environmental Education, as a field of study, enhances critical thinking, problem-solving effective decision-making skills and teaches individuals to weigh various sides of an environmental issue to make informed and responsible decision.

Environmental Education does not advocate a particular view or course of action, rather it involves a process in which individuals gain awareness of their environment and acquire knowledge, skills, values, experiences and determination which will enable them to act individually and collectively to solve present and future environmental problems (Woodrol, 2004; Ogunbiyi, 2006). For instance, heavy rainfalls between June and August in recent years have caused hundreds of thousands of people being displaced while property running into billions of naira were destroyed. Some of the worst affected are communities in Sokoto, Kebbi and Jigawa States in the northern part of Nigeria where the Goronyo Dam in Sokoto State overflowed its banks, and in Lagos and Ogun States in the western part of Nigeria as a result of release of water from the Oyan dam by the Ogun-Oshun River Basin Development (Kwale, 2010; Offiong, 2011; Amokaye, 2012; Isa, 2014). This makes Environmental Education a continuous issue of relevance among Nigerians in view of the enormity of the environmental challenges currently facing the country.

Bosah (2013) argued that Environmental Education in Nigeria is the key to creating environmental consciousness and awareness among students of primary, secondary and tertiary institutions. This is critical to empowerment for participation in decision-making, with regards to addressing some of the world's vital environmental issues and challenges. More recently, Norris (2016) submitted that actualizing the goals of Environmental Education in Nigeria will enable the target beneficiaries to possess skills, knowledge, motivation and attitude in tackling various environmental issues and problems. In practical terms, this implies working to improve the quality of the Nigerian environment, thereby making Nigerians engage in environmental actions supportive of eco-friendliness.

The present research focused on four Environmental Education concepts which are listed in the Junior Secondary School (JSS) class two curriculum for Social Studies (NERDC) to include: desertification, pollution, erosion and waste management. Recent studies on Environmental Education as a component of Social Studies Education equally supported the choice of these concepts as issues of concern in the Nigerian environment (Ogunbiyi, 2006; Ogunyemi & Ifegbesan, 2011; Ogunyemi, 2014). The solution to problems associated with survival in the Nigerian environment may require conscious and continued training in the use of problem-solving skills. Students in Social Studies have found it difficult to do well in the subject probably because of the teaching methods adopted by the teachers or environmental factors. Students in Social Studies report very low achievement in the subjects (Adeyemi, 2016). It is disheartening to note that the level of performance of

students in Social Studies is not expectedly (Adeyemi, 2016). The rate of underachievement in the subject Social Studies is not encouraging in the pursuit of educational goals and objectives in secondary schools in Nigeria (Yusuf, 2018). The failure rate in Social Studies could be attributed to negative value system and orientation of students towards the subject (Yusuf, 2018). Students have been found to express negative attitude to subjects that are environmentally oriented (Yusuf, 2018; Enefu, 2019). Attitude of the students is tampered with when they come across pollution in environmental education (Ogbonnaya, 2017; Ikedia, 2018). Poor attitude can be corrected through the use of cognitive and behavioural packages (Ibrahim, 2019). Based on the efficacy of cognitive and behavioural packages in the management of behavioural and perceptive issues, the researchers are proposing the use of Hartman problem solving strategy in the enhancement of students' achievement and positive attitude development among students.

One of such proposed strategies is Hartman's problem solving strategy by Hartman Hope developed in (1999). The problem solving strategy is a collaborative problem solving method where problems are solved analytical through group reflections. In order for Social Studies to respond to this challenge, instructional strategies in the subject must be rooted in approaches that address specific tasks such as problems detecting, problem-solving, and learning by experimenting and discovery learning (Adeyemi, 2008).

### **Purpose of the Study**

The main objectives of this study was to investigate the effects of Hartman's problem solving strategy on Junior Secondary School (JSS) student's achievement and attitude to Environmental Education aspect of Social Studies. In specific terms, the objectives of the study were to:

1. determine the effect of Hartman's problem solving strategies on the achievement mean score of students in Environmental Education aspect of Social Studies.
2. determine the effect of Hartman's problem solving strategy on the attitude mean score in Environmental Education aspect of Social Studies.

### **Research Questions**

The following research questions guided the study:

1. What is the effect of Hartman's problem solving strategies on the achievement mean score of students in Environmental Education aspect of Social Studies?

2. What is the effect of Hartman’s problem solving strategy on the attitude mean score in Environmental Education aspect of Social Studies?

**Methodology**

The study adopted a pre-test, post-test, control group quasi-experimental design with a 3x2x2 factorial matrix. Three intact classes of subjects were involved in the test administration before and after the experiment. While there were treatments in the first two groups, there was none in the third group. The experimental design is illustrated below:

0<sub>1</sub> X<sub>1</sub> 0<sub>2</sub> -----experimental I  
 0<sub>3</sub> X<sub>2</sub> 0<sub>4</sub> -----experimental II  
 0<sub>5</sub> 0<sub>6</sub> -----control

Where:

- 0<sub>1</sub>, 0<sub>3</sub>, 0<sub>5</sub>, represent the pre-test for the three groups.
- 0<sub>2</sub>, 0<sub>4</sub>, 0<sub>6</sub>, represent the post-test for the three groups.
- X<sub>1</sub> represents the second teaching strategy (Hartman’s problem-solving strategy)

The target population for this study consisted of all public Junior Secondary School (JSS) year two (JSSII) Social Studies students in Ogun State, Nigeria. The sample for the study consisted of one hundred and thirty-three (133) JSS Social Studies students in three intact classes and selected through a multi-stage sampling procedure in Ogun State. First, three out of the four geo-political divisions (Egba, Yewa, Remo and Ijebu) of Ogun State were chosen through the simple random sampling technique. Thereafter, all public junior secondary schools located at the headquarters of each division were listed on pieces of paper and rolled. Subsequently, one school was randomly selected in each division to arrive at three target schools. Common to all the schools selected was the presence of graduate (B. Ed/B. Sc Ed) Social Studies teachers and any school which did not meet that requirement was dropped and another one selected to replace it. This requirement was to ensure that teachers recruited as field assistants had a comparable academic qualification. From each school, an intact class of JSS II was randomly allocated into each of the two treatment conditions and the control. Where there was more than one JS II class, a simple balloting was done. All students in each of the selected classes formed the participants in the study.

Two instruments were used for this study. These are Environmental Education Concept Achievement Test (EECAT) and Attitude to

Environmental Education Questionnaire (ATEEQ). The researchers made use of Teacher Instructional Guides (TIG) for the treatment.

### **Environmental Education Concept Achievement Test**

The Environmental Education Concept Achievement Test (EECAT) was used to assess Social Studies students' knowledge of Environmental Education concepts. It consists of two sections. The items consisted of eighty (80) multiple-choice objective test items with four options per item which were pooled from various past questions obtained from the cooperating schools. Thirty (30) items were finally arrived at following an item analysis procedure (difficulty and discriminative analysis) guided by an expert in Test Construction. The final version of EECAT covers four topics selected from the JSSII Social Studies curriculum which were taught in the study. Table.1 presents the distribution of items in EECAT according to level of coverage within the cognitive domain.

**Table.1: Table of Specification for EECAT**

Topics	Remembering	Understanding	Thinking	Total
Desertification	8,33,36,65,75	5,13,32,63,66	1,9,31,34,35,37,38,39,64	19
Pollution	2,3,41,43,45,46,80	11,12,18,19,22 42,44,47,76,78,79	23,24,26,29,30,40,74	25
Erosion	4,49,51	6,7,48,50,68,69	14,21	11
Waste Management	10,15,58,72,77	16,17,20,52,53, 54,55,56,57,59, 62,70	25,27,28,60,61,67,71,73	25
<b>Total</b>	<b>20</b>	<b>34</b>	<b>26</b>	<b>80</b>

The EECAT covers four topics selected from the JSSII Social Studies curriculum which were taught in the study. Table 1 presents the distribution of items in EECAT according to level of coverage within the cognitive domain. The 80 items were subjected through items analysis procedure guided by an expert in Test Construction giving credence to its difficulty index and discriminating index. Items that could not properly discriminate were removed while items with high difficulty indices were also removed many from the items.

The EECAT was given to three experts in Social Studies education to assess the face and content validity to ensure that the items satisfied appropriate discrimination and difficulty levels. The suggestions made by these experts were taken into effect. The test was also presented to two experts in test and measurement in the defunct Department of Curriculum Studies and Instructional Technology (CSIT) for further scrutiny and modification. To ascertain the reliability of (EECAT), the instrument was administered on fifty

JSS II students in a secondary school outside the participating schools. Kuder Richardson 20 was used to determine the reliability coefficient and the coefficient was found to be 0.64 which makes the instrument reliable for use.

### **Attitude to Environmental Education Questionnaire**

Students' attitude towards Environmental Education was measured through the "Attitude to Environmental Education Questionnaire (ATEEQ) constructed by the researcher. The ATEEQ was designed to seek respondents' feelings, ideas, and views on a four-point Likert-type response. The responses are Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). This section was made up of twenty items out of which thirteen were positively-worded and seven were negatively-worded items. The first draft of the instrument was given to two Social Studies educators in two tertiary institutions and two social studies teachers to ascertain its content and face validity also to find out the suitability of the language and its applicability to the student's maturity level. Their suggestions were used to further simplify and restructure the final version of the ATEEQ. The ATEEQ was administered to fifty students from junior secondary school (JSSII) in the same school used for test-running the achievement test. Thereafter, Cronbach Alpha was used to determine the reliability coefficient of the instrument based on the data collected. The coefficient was found to be 0.774, which makes the instrument reliable for use.

### **Teacher's Instructional Guides (TIG)**

The teacher instructional guide consists of the compendium of instructional strategies for guiding the teachers' interactions in the two experimental schools, that is, with respect to Hartman's instructional strategies respectively.

**Hartman's problem-solving strategy:** The experimental group students in School were prepared by the teacher based on the following steps:

*Step 1:* The teacher or the thinker introduces the topic by explaining the meaning and identifies the source of the problem.

*Step 2:* The second pair or the listener responds to the questions as solutions to the problem.

**Conventional Group:** There was no formal teaching in the school where the conventional group was located. The video materials used to teach the four environmental education concepts (Pollution, Desertification, Erosion and Waste Management) were made available to Social Studies teacher who

served as Field Assistant in the control group school. However, the teacher was only to pass the videos in their packaged format to the students without showing the contents or teaching the topics involved.

### **Research Assistant Competency Rating Scale**

A Research Assistant Competency Rating Scale (RACRS) was employed to guide the training of research assistants for the two experimental groups. The instrument was used to assess the level of competence of the research assistants in the use of each of the two sets of Teacher's Guides. The instrument contains thirteen items which the researcher used to rate the research assistants when demonstrating their teaching activities in the groups. The rating scales were validated by giving it to three experts in pedagogy to determine its face and content validity. Four Social Studies teachers (two per school) who were rated above 70% were finally engaged for the experimental schools. Data collected in the study were analyzed using the Statistical Package for Social Sciences (SPSS). The analysis involved descriptive statistics. The descriptive data were used to answer the research questions (using mean and standard deviation).

### **Presentation of results and data analysis**

Findings in the study are presented through descriptive data. The descriptive part focuses mainly on answering the research questions

**Research Question 1:** What is the effect of Hartman's problem solving strategies on the achievement mean score of students in Environmental Education aspect of Social Studies?

**Table.1: Distribution of Pre- and Posttest Achievement scores of students in Environmental Education concepts in Social Studies according to instructional strategies**

Treatment Groups		Achievement test		Mean Gain
		Pre-test	Post-test	
Conventional	N	38	38	4.36
	Mean	14.82	19.18	
	SD	5.802	6.035	
	Min	4	6	
	Max	27	29	



Hartman's	N	44	44	
	Mean	16.34	23.70	7.36
	SD	6.280	5.312	
	Min	3	9	
	Max	27	29	
Control	N	51	51	
	Mean	22.80	24.18	1.38
	SD	3.388	3.064	
	Min	15	15	
	Max	28	29	

Table.1 show Hartman's problem-solving strategy had a mean pre-test of 16.34 and a mean post-test achievement score of 18.70. The group taught with conventional method had a mean pre-test score of 22.80 and a mean post-test achievement score of 24.18. In Hartman's problem-solving 7.36 (23.70-16.34) and the Conventional method 4.36 (19.18-14.82). Hence, Hartman's problem-solving strategy and Conventional method groups respectively.

**Research Question 2:** Which of the Hartman's instructional strategy will record the higher mean attitude gain score in Environmental Education aspect of Social Studies?

**Table.2: Distribution of Pre- and Posttest Attitude cores of students in Environmental Education concepts in Social Studies according to instructional strategies**

Treatment Groups		Attitude test		Mean loss
		Pre-test	Post-test	
Conventional	N			
	Mean	56.50	52.95	-3.55
	SD	8.785	4.104	
	Min	36	38	
	Max	78	80	
Hartman's	N			
	Mean			
	SD	51.57	43.02	-8.55
	Min	6.304	8.028	
	Max	40	30	
		63	70	

Control	N			
	Mean	46.31	47.10	0.79
	SD	7.739	6.685	
	Min	31	34	
	Max	72	69	

Table 2 reveals that Hartman's problem-solving strategy had a mean pre-test attitude score of 51.57 and a mean post-test of 43.02. Students taught with the Conventional method had a mean pre-test score of 56.50 and a post-test attitude score of 52.95. In terms of attitude enhancement, Hartman's problem-solving strategy recorded attitude mean of -8.55 (43.02-51.57) and the Conventional method recorded attitude mean reduction of -3.55 (52.95-56.50). This suggests that Hartman's group strategy was able to reduce negative attitude than the conventional method as compared to the control which further increased the negative attitude 0.79(47.10-46.31).

### Discussion of Findings

Hence, this research has generated some evidence in support of the call for the use of problem-solving strategies as ways of promoting Environmental Education aspect of Social Studies in Nigeria's junior secondary schools. This finding is supported by the fact that poor attitude can be corrected through the use of cognitive and behavioural packages (Ibrahim, 2019). Based on the efficacy of cognitive and behavioural packages in the management of behavioural and perceptive issues, the researchers' proposal of the use of Hartman problem solving strategy in the enhancement of students' achievement and positive attitude development among students became very efficacious. However, it must be noted that the study's finding differs from the conclusion of Frazee and Ayers (2003) that the conventional method of instruction is the background to good teaching and that it could produce better results than some innovative methods when correctly applied. This indicates that the finding on the potency of problem-solving strategies in this study cannot be taken as conclusive.

### Conclusion

This study examined the effects of Hartman's problem-solving strategies on achievement in and attitude towards Environmental Education concepts in Social Studies. Evidence from the study showed that Hartman's instructional problem solving strategy promoted higher achievement gain than the Conventional method of teaching Environmental Education concepts. More so, Hartman's instructional problem solving strategy reduced negative attitude

towards the concept of environmental education than the conventional teaching method. However, the Hartman's and convention instructional strategies proved to be more effective than the control group.

### **Recommendations**

In view of the findings of this study, the following recommendations are proposed:

1. Government should provide opportunities (seminars and workshops) for practicing teachers to learn more about problem-solving instructional strategies as part of efforts to promoting improved teaching and learning of Environmental Education in Social Studies.
2. Social Studies methodology courses within Teacher Education programmes should continually develop teacher trainees (Pre-service and In-service) on problem-solving skills to enhance their capacity to use strategies involved at the classroom level with particular reference to Environmental Education concepts.
3. Teachers should make use of Conventional Method in support of the Hartman problem solving instructional strategy of Social Studies, especially in respect of factual knowledge about the environment.
4. Authors of textbooks, curricula and instructional materials on Environmental Education and Social Studies should provide additional information on the usage of Hartmans problem solving strategies.

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