

# **EFFECT OF LEARNING CYCLE APPROACH ON STUDENTS ACHIEVEMENT IN BASIC SCIENCE**

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## **Abstract**

The study investigated the Effect of Learning Cycle Approach on Students Achievement in Basic Science. Two research questions and two null hypothesis guided the study. The design used was quasi experimental design. A total of 173 Upper Basic One (J.S.S.1) students were randomly selected from the four schools in Onitsha North Local Government Area. The instrument for data collection was Basic Science Achievement Test (BSAT) which has 0.92 Pearson product moment correlation coefficient. Mean scores were used to answer the research questions while ANCOVA were used to answer the hypothesis at 0.05 level of significance. The findings revealed that learning cycle approach enhanced students' achievement in Basic Science. It was recommended that learning cycle as a method of teaching should be adopted as an effective strategy in teaching Basic Science since it affects students' achievement.

Learning approach is an inquiry based teaching model which can be useful to teachers in designing curriculum materials and instructional strategies in science (Lawson, 2001). Learning cycle approach is derived from constructivist ideas of the nature of science, and the developmental theory of Jean Piaget. Inquiry based method drawn upon constructivist learning theories where understanding is built through the active development of conceptual mental frameworks by the learner (Piaget, 1990). Learning cycle model divides the activities of instruction into phases. In this approach, students are first given experience with a concept to be developed and is called exploration phase. This is followed by the conceptual invention phase where the students and teachers derive the concept from the data. The final phase, the application

phase gives the students the opportunity to explore the usefulness and application of the concept.

Learning cycle can be distinguished from the traditional approaches (exposition method), hence, it emphasizes on the explanation and investigation of phenomena, the use of evidence to back up conclusions and the designing of experiments. Traditional approach emphasizes on the development of skills and techniques, the receiving of information and the knowing of the outcome of an experiment before doing it (Abraham, 2001). Renner (2006) said that learning cycle approach can result in greater achievement in science, better retention of concepts, improved attitudes towards science and science learning, improved reasoning ability and superior process skills that would be the case with traditional instruction approaches. This is especially true with intermediate level where students' instructional activities have a high level of intellectual demand (Lott, 2004). Lawson (2001) has said that instructional strategies utilized to teach science concepts are most effective when they include activities which serve three functions:

1. To introduce the concept
2. To discuss the concept
3. To apply the concept.

The 5<sup>E</sup>'s learning cycle mode developed by Robert (1997) was targeted at the discovery and the association with previous knowledge of new concepts by students, with the aid of planned and applied learning and teaching activities, where students form themselves by their own knowledge about a specific problem. The learning cycle 5<sup>E</sup>'s model are Engage, Explore, Explain, Elaborate and Evaluate. The first phase which is the engage cycle model is to focus the students' attention on the topic. In this phase, there is no lecturing and the subject of course is not taught to the students. This phase involves asking pointed questions, explaining a concept, demonstration of an event, showing picture or making a discussion which are used to focus the students attention on the task that will follow and connects them to past learning, and experience are involved for teachers, this phase provides opportunities for determining student's misconceptions (Balei, 2005). The second phase is the explore model where the students make the most activities. In this phase, students try to solve the given problem by working and discussing in groups. Meanwhile, teachers only guide students but they do not participate entirely in the students work.

The third phase which is the explanation model is the teacher centered phase where the teacher becomes active for correcting mistakes. Teachers may choose lecture method like giving an activity which led the students to define their work. In this phase, the teacher only give formal definition. The fourth phase which is the elaborate model is

the phase where the students practice their new knowledge. The fifth phase of the learning cycle is evaluation. It has the importance of determining whether the students learn the concept correctly. Some evaluations are made for revealing students constructed knowledge. Students may answer to oral questions, make short summaries and fill out empty maps and so on. Hence, students exhibit their thinking style or behaviours. The phase of 5<sup>E</sup>'s learning cycle model stimulates and motivates students to explore, inquire, get experience and also transmit their critical thinking skills.

### **Purpose of the Study**

The study was designed to;

1. determine the effect of learning approach on students achievement in Basic Science,
2. determine the effect of performance level of the students using learning approach and those using traditional method.

### **Research Questions**

The following research questions guided the study;

1. what are the performance levels of students taught with learning cycle and those taught with traditional method?
2. what are the mean achievement scores of male and female Basic Science students taught using learning cycle and those taught using traditional method?

### **Hypotheses**

Two null hypotheses guided the study:

Ho<sub>1</sub>: There is no significant difference in the performance level of students taught with learning cycle and those taught with traditional method.

Ho<sub>2</sub>: There is no significant difference in mean achievement scores of male and female Basic Science students who were taught using learning cycle and those taught using traditional method.

### **Research Method**

The experimental design used for the study was quasi experiment. A targeted population of five thousand, two hundred and twenty-nine students (5,229) in upper Basic Secondary School (J.S.S.1) students, was used. A total of sixteen (16) public secondary schools within Onitsha North Local Government Area in Anambra State. The sample comprises of one hundred and seventy three (173) upper Basic Secondary school students of J.S.S.1 where randomly selected from four schools in Onitsha North Local

Government. The researcher use simple random sampling of balloting with replacements to select the assigned students to experimental and control group. Eighty-four (84) students were in experimental group while eighty-nine (89) students were in control group. The instrument for data collection was Basic Science Achievement Test (BSAT) which consists of 30 multiple choice (objective questions) items based on living and non-living things. The achievement test was constructed based on the curriculum and scheme of work.

### **Treatment Procedure**

The two groups (group A and B) were first pre-tested with BSAT. The experimental group was taught the selected Basic Science concepts by a Basic Science teacher in their intact classes immediately after their lesson, the control group was taught by another teacher in the students' intact class. The teachers were instructed to teach them based on the selected topics in Basic Science. The two groups were taught for three weeks of double period of 80 minutes per week during school period. The teachers were used both for pre-test and post-test. The selected teachers used were trained for the period of one week for the research. The total number of students randomly selected for the study was 173, which comprises of 92 females and 81 males for both the experimental and control group. After the three weeks, two days were allowed for revision. After, a post-test was given to all the groups. The gain in knowledge of the topics was determined using the pre-test and post-test BSAT scores.

The results were analyzed using the mean to answer the research questions and analysis of covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance. A reliability co-efficient of 0.97 using Pearson product moment correlation was used.

### **Presentation of Results**

The results were presented in tables according to the research questions and hypothesis.

**Table 1: Mean and Standard Deviation of Students Taught with Learning Cycle and Those Taught with Traditional Method**

<b>Group</b>	<b>Number</b>	<b>Mean</b>	<b>Standard Deviation</b>
Experimental	84	47.21	27.34
Control Group	89	30.92	19.18

From the table above, the mean achievement scores of students taught with learning cycle approach (experimental group) and traditional method (Control group) were 47.21 and 30.92 while the standard deviation were 27.34 and 19.18.

**Table 2: Mean Achievement Scores of Male and Female Basic Science Students Taught Using Learning Cycle and Those Taught Using Traditional Method**

Group	Mean Pre-Test	Mean of Post-Test	Gain Score
Experimental			
I (Males)	18.90	23.49	
I (Females)	15.21	23.72	
Control			
II (Males)	12.80	13.88	
II (Females)	12.29	17.04	

**Table 3: Summary of ANCOVA for Students Taught with Learning Cycle and Those Taught with Traditional Method**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected Model	9622.023	2	4811.011	343.179	.000
Intercepts	2886.947	1	2886.947	205.931	.000
Pre-Test	6863.821	1	6863.821	489.609	.000
Method	838.743	1	838.743	59.829	.000
Error	2383.226	170	14.019		
Total	77769.000	173			
Corrected Total	12005.249	172			

F – value of 59.829, P = 000 < 0.5, hypotheses 1 was rejected, so there is significant difference in the performance level of students taught learning cycle and those taught with traditional method.

**Table 4: Summary of Analysis of Covariance of Mean Achievement Scores of Male and Female Basic Science Students Who were Taught Using Learning Cycle and Traditional Method**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected Model	9258.627	2	4629.34	286.528	.000
Intercepts	1978.158	1	1978.158	122.437	.000

Pre-Test	9171.489	1	9171.469	567.662	.000
Gender	475.348	1	475.348	29.421	.000
Error	2746.621	170	16.157		
Total	77769.000	173			
Corrected Total	12005.249	172			

F – value of 29.421,  $P = 000 < 0.5$ , hypotheses 2 is rejected and there is significant difference in mean achievement scores of male and female Basic Science students who were taught using learning cycle and those taught using traditional method.

### **Discussion of Findings**

The result in table 1 shows that there is significant difference in the mean performance of students taught with learning cycle approach and those taught with traditional method. The result in table 2 shows that there is significance difference in the male and female taught Basic Science using learning cycle approach and those taught using traditional method.

Results in table 3 and 4 (used in answering research questions) shows there is significance difference in the performance level of students taught with learning cycle and those taught with traditional method. Although all the students had enhanced achievement after the treatment, the result tends to favour those in experimental group. The trend of higher performance by the treatment group could be as a result of acquiring science process skills along side with knowledge. According to Lord (1999), the phases help to extend students conceptual understanding and allows them to practice skills and behaviour. The learning cycle model provides learning as a new concept (Ergin, 2006).

Gender has an effect on the achievement of students in learning cycle. This discrepant trend in gender-related difference in achievement and retention has been explained in terms of retention between gender and science content areas (Nworgu, 2009). Another possible explanation of the interaction between gender and age according to Clements (2002), is beyond dispute that in most cultures, sex-related difference is in favour of males appear from adolescents.

### **Conclusion**

The study revealed that the learning cycle approach is an effective method that will help the teachers in teaching Basic Science and also will help the students in learning of science. It needs to be encouraged by the government and should be mandatory to all teachers especially in their workshops, seminars and conferences.

### **Recommendations**

Based on the findings, the following recommendations were made.

1. Basic Science teachers should be encouraged to employ 5<sup>E</sup>'s learning cycle in teaching of the subject so as to improve the student's achievement.
2. Teachers should acquaint themselves through training with the distractive characteristics of the teaching techniques with a view to enhance students' achievement and effective outcome of learning which can be done through seminars, conferences and workshops organized by government and profession bodies like Science Teachers Association of Nigeria (STAN).
3. Educators should include the learning cycle model approach in curriculum of post primary schools as a method of teaching.
4. The ministry of Education in Nigeria should organize seminars, conferences and workshops for Basic Science teachers on the use of learning cycle approach in teaching Basic Science.

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