

**AFRICAN SOCIAL AND EDUCATIONAL JOURNAL  
FACULTY OF BUSINESS ADMINISTRATION  
IMO STATE UNIVERSITY  
NIGERIA**

**VOL. 9 NO. 1 MARCH 2020**

**IMPLEMENTATION OF CONSTRUCTIVISM APPROACH FOR PHYSICS LEARNING IN  
VOCATIONAL AND TECHNICAL EDUCATION SCHOOLS IN EDO STATE**

**EVANS OMOZOKPEA ONOMENDO**

**Department of Physics  
School of Sciences College of Education  
Igueben, Edo State.**

**And**

**SADIQ OSHOKE AKHOR**

**Department of Business Education  
School of Vocational and Technical Education  
College of Education, Igueben Edo State**

***Abstract***

*The demand of scientific and technological materials to make man more comfortable with his immediate environment is on a high rampage. Physics is a fundamental of science and technology subject or course which is required in secondary and higher schools for learning. Constructivism approach is required which enables learner to define their own need and exercise their strategic view in learning process. Achieving this, a study was carried out in vocational and technical schools in Edo State on implementing constructivist approach to move learning from teacher centered to learner centered. A sample of 10% of 1454 students was random selected for the study which is 146 students. The one hundred and forty six (146) students will be divided into two group, that is experimental and control group, 5% population of the selected students will be seventy three (73) students for experimental and 5% population of the selected students will be seventy three (73) students control group which amount to a sum total of one hundred and forty six (146). The instrument for the collection of data will be Achievement Test in physics (ATP). The t-test statistics was used to analyse the data used for the study at alpha level of 0.05. Result from research shows that students with constructivist approach had a better performance in physics practical's mechanics and electronics courses. A number of recommendations to heighten the implantation of constructivism in schools were proffered*

*Key words: Constructivism, Learning, Vocational and Technical*

**Introductions**

The level of development of any nation is rated through its attainment in science and technology and no nation can rise above it level of Education (Emuhi, 2010). Science and technology which involve manipulative skills are required in the field of vocational and technical

Education coupled with constructivist approach. This has an impact on moving education from its present level to a higher level which has the possibility of improving and increasing the present state of the economy of our dear nation. *Physics is believed to be one of the oldest and probably the most developed science subject (Keith, 1996)*. Physics is one of the science subjects taught at the senior secondary school level in Nigeria and it is required in the vocational and technical schools based on the fact that physics involves practical and manipulative skills which are useful and applicable during the implementation of scientific knowledge. It is one of the pre-requisite subjects for the study of technology and other applied science courses in institutions of higher learning.

Knowing has roots in both biological/neurological construction, and social, cultural, and language based interactions (Dewey, 1916/1980; Garrison, 1997, 1998; Gergen, 1995; Maturana and Varela, 1992). The study of Physics requires a constructivist approach in representation like experiments, formula and calculations, graphs and concepts explanation. Constructivism is an approach in which learners (students) construct knowledge and ideals for themselves individually and construct meanings as they learn specifically during practical's.

Constructivism, as a fundamental principle underlying philosophy of constructivism, believes that all knowledge is constructed and not constructed directly perceived by the senses (Muijs and Reynolds, 2008). Vocational and technical education is activity oriented, various interesting activities are learnt and centered on acquisition of knowledge and skills that apply to our daily lives for survival. For a nation to flourish maximally it should be science oriented (Jegede, 2000). Physics a subject where equations are derived to solve man's problem applying the constructivism approach as a root course of technology required in vocational and technical schools. Over the years, other teaching and learning techniques have been adopted in teaching and learning physics other than the constructivist approach. From this view there is the necessity to look into the use of constructivist approach in teaching and learning physics in the institutions of vocational and technical schools to see the impact and contributions to individuals, social and economic trend of our country since science and technology holds the key rapid, sustainable economic growth and the transmission of relevant skills to the learner, this will provide a desirable learning skills both to the trainer and the trainee.

### **Statement of the Problem**

Ugbebor (2009) found that students' pre-conceptions of Physics concepts affected student success in colleges. Other factors that were found to contribute to students' performance in Physics are teachers' method of teaching which is a major concern in this study in order to change the student's concept and approach in studying physics at the vocational and technical schools. This will ultimately lead to the increase in students enrolments in the science and technology courses whereby improving the social, economic and technological development of the country. Against this backdrop, some specific research questions were raised.

These are:

1. Are there any significant different between implementation and non-implementation of strategies and process of constructivist approach in teaching and learning physics?
2. Is there significant different between the constructivist students and non-constructivist students' performance in electronics.

3. Is there any significant different between other methods and constructivist approach in teaching and learning of physics practical's?
4. Is there any significant different between student's performance with constructivist approach and those without constructivist approach in the teaching and learning of physics for auto mechanic students?

### **Objective of the study**

The broad objective of the study is to investigate the implementation of constructivist approach in the teaching and learning of physics in vocational and technical schools in Edo state.

However, to achieve these broad objectives, some specific objectives were set. The specific objectives are to:

1. Strategies and process for full implementation of constructivist approach in teaching and learning of physics.
2. To ascertain the impact of constructivist students and non-constructivist students' performance in electronics.
3. The impact of constructivism approach to other method of teaching and learning physics practical's.
4. To examine student's performance with constructivist approach and those without in teaching and learning of physics for auto mechanic students.

### **Research Hypothesis**

The following research hypothesis was formulated by the researcher and will be tested at 0.05 level of significance.

1. There is no significant different between implementation and non-implementation of strategies and process of constructivist approach in teaching and learning physics for electrical installation?
2. There is no significant different between the constructivist students and non-constructivist students' performance in electronics.
3. There is a significant difference between teacher centered and constructivist approach in teaching and learning of physics practical's.
4. There is a significant different between student's performance with constructivist approach and those without in teaching and learning of physics for auto mechanic students.

### **Significance of the study**

Presently, Nigeria is still at infancy in terms of scientific and technological strides, for independency in terms of science and technological innovations this study will lay emphasis on changing the students perception of physics since it is the basic of science and technology to key in and increase their level of performance and participation of physics during the implementation of scientific principle into realities.

### **Scope of the study**

This study focuses on the implementation of the constructivist approach in the teaching and learning of physics in vocational and technical schools among students in Edo State.

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**Method**

**Population of the study**

The population will consist of a total number of science students in technical schools in Edo state. The total population selected is One thousand four hundred and fifty four (1454) students among the selected schools. One thousand four hundred and fifty four (1454) were random selected from the four (4) Government science and technical College (GSTC) within the state.

**Sample and Sampling Technique**

The schools sampled for this study is four (4) vocational and technical schools in Edo state with total number of science student was gathered to be One thousand four hundred and fifty four (1454) respondents that will be drawn from the four established Government science and technical schools (GSTC).

The size sample for this study is made up of one hundred and forty six (146) students, which is 10% of the population. The purposive sampling technique was used to select this sample size in order to ensure adequate representation of the schools involved, such that the entire student will be divided into two groups. The one hundred and forty six (146) students will be divided into two group, that is experimental and control group, 5% population of the selected students will be seventy three (73) students for experimental and 5% population of the selected students will be seventy three (73) students control group which amount to a sum total of one hundred and forty six (146).

The learning process should provide an opportunity for learners to acquire knowledge itself in accordance with the prior knowledge they already had, which is the result of interaction with the environment. Such learning process is in accordance with the constructivist view.

The experimental research design will be used in this study that is the Non-Random Pre-test Post-test Control Group.

The research subjects were 73 students as the experimental group and 73 students for the control group. The experimental group in this research is the group that was taught by the constructivist approach (student-centered), while the control group was taught by the teacher-centered approach.

**Research Instrument**

The instrument for the collection of data will be Achievement Test in physics (ATP).The test will contain 30 multiple choice questions. The respondent where grouped in two groups, in which a group of students was grouped into the constructivist approach and teacher centered.

**Administration of Instrument**

The researcher visited each of the schools selected for the study with the cooperation of the school heads and teachers to administer the copies of the questions to the students in vocational and technical schools sampled for the study across the state. Copies of the question paper were collected from the students.

**Method of data analysis**

To test the objective of this study, the t-test statistics was used to analyze the data used for the study at alpha level of 0.05

### Data Analysis, Presentation and Discussion of Findings

The information gathered through the use of achievement test in Physics (ATP) questions is presented and result was deduced. The presentation of results and discussion of research findings in learning physics through constructivist approach and the teacher centered. The result shows response to the various research questions between the constructivist student and the teacher centered in pre-test and post-test was used to deduce data from the vocational and technical schools in Edo State which we will use to test the research question raised in chapter one.

**Table. 1**

Names Of Schools	Number of pupils	Percentage (%)	Sampled students
GSTC Afuze	72	4.9	7
GSTC Benin	1236	85	123
GSTC Irrua	73	5	8
GSTC Igarra	73	5	8
<b>Total</b>	<b>1454</b>	<b>99.9</b>	<b>146</b>

**Note:** N=number of students, X=mean value of score, SD=standard deviation, t=t-test calculated and constant

### Results

**Research Question 1** The table below shows analysis the data to respond to the research question which states; Are there any significant different between implementation and non-implementation of strategies and process of constructivist approach in teaching and learning physics?

### T-test for experiment and control group

**Table. 2**

Source	N	X	SD	Df	t	t-calculated	Decision
Experiment	70	62.12	6.52	3	1.960	0.84	There is a Significant Difference
Control	70	59.14	6.49	3			

From table 2 the results for experimental group shows a mean value of 62.12 and control group 59.14, standard deviation value of 6.52 and 6.49 respectively and a t-calculated

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value of 0.84 this shows that there is no significant difference between the constructivist approach and the teacher centered control group in the technical and vocational schools for study.

**Research Question 11**

There is a significant different between the constructivist students and non-constructivist students' performance in electronics. The summary of result is shown in table 3

**Table .3**

Source	N	X	SD	Df	t	t-calculated	Decision
Experiment	70	63.21	6.82	3	1.960	0.50	There is a Significant Difference
Control	70	53.71	5.38	3			

The mean value of experimental group arrived at 63.21 and control group at 53.71 and standard deviation shows 6.82 and 5.38 respectively and a t-test value of 0.5 this shows that there is a significant different between the constructivist students and non-constructivist students' performance in electronics.. Physics play a vital role in the field of vocational and technical schools among students learning during practical studies.

**Research Question 111**

There is a significant difference between teacher centered and constructivist approach in teaching and learning of physics practical's. The summary of the result is shown in table 4 using the t-test.

**Table .4**

Source	N	X	SD	Df	t	t-calculated	Decision
Experiment	70	65.57	5.50	3	1.96	2.15	There is a Significant Difference
Control	70	59.14	6.49	3			

The table shows a mean value 65.57 for experimental and 59.14 for control and a standard deviation value of 5.50 and 6.49 have a t-test value of 2.15 this shows that there is

impact of constructivism approach to other method of teaching and learning physics among the students of Government science and technical schools.

#### Research Question IV

Is there any significant different between student's performance with constructivist approach and those without teaching and learning of physics for auto mechanic students? The summary of the result is shown in table 4.5 using the t-test.

**Table 5**

Source	N	X	SD	Df	t	t-calculated	Decision
Experiment	70	72.29	5.00	3	1.960	22.01	There is a Significant Difference
Control	70	53.14	6.58	3			

The values on table. 5 explicitly shows that there is a significant different between student's performance with constructivist approach and those without in teaching and learning of physics for auto mechanic students. The mean value for constructivist student that is experiment and control group student centered have the values of 72.29 and 53.14 respectively which shows a significant difference having a standard deviation values of 5.00 and 6.58 respectively and t-test value of 22.01.

#### Discussion

Knowing has roots in both biological/neurological construction, and social, cultural, and language based interactions (Dewey, 1916/1980; Garrison, 1997, 1998; Gergen, 1995; Maturana and Varela, 1992). The study of Physics requires a constructivist approach in representation like experiments, formula and calculations, graphs and concepts explanation.

Constructivism, as a fundamental principle underlying philosophy of constructivism, believes that all knowledge is constructed and not constructed directly perceived by the senses (Muijs and Reynolds, 2008). Knowledge is the result of a cognitive construction of reality through one's activities. Someone forming schemes, categories, concepts and knowledge structures. The formation process is running continuously at any time reorganized for their new understanding has characteristics consistent constructivist approach. According to Brooks (Brooks and Brooks, 1993).

Findings of this research shows showed the average learning outcomes of Physics students with constructivist approach (student-centered) is a little higher than the control group (teacher-centered). From the various table using the t-test for both experimental and control group it shows that there is no significant difference between the constructivist students and the teacher centered.

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From table 2 the results for experimental group shows a mean value of 62.12 and control group 59.14, standard deviation value of 6.52 and 6.49 respectively and a t-calculated value of 0.84 this shows that there is no significant difference between the constructivist approach and the teacher centered control group in the technical and vocational schools for study. This affirms to research question one and to the fact that three continuum of constructivism have contributions to learning and teaching process, categorically the radical constructivism was most applicable in the field during study. It is obvious that physics learning fully embraces the first three epistemological tenets known as; that knowledge acquisition is an adaptive process that results from active cognizing by the individual learner, rendering an experientially based mind, not a mind that reflects some external reality.

From table 3 a response to research question two, mean value of experimental group arrived at 63.21 and control group at 53.71 and standard deviation shows 6.82 and 5.38 respectively and a t-test value of 0.05 this shows that there is no significant difference between the constructivist students and non-constructivist students' performance in electronics. This answers research question raised that the constructivist students with an experiential based mind perform better in the fields of physics knowledge in electronics.

From table 4 shows a response to research question three having a mean value 65.57 for experimental and 59.14 for control and a standard deviation value of 5.50 and 6.49 have a t-test value of 2.15 this shows that there is impact of constructivism approach and a significant difference to other method of teaching and learning physics among the students of Government science and technical schools. Constructivism is a theory of learning that has roots in both philosophy and psychology. The data collated affirm that essential core of constructivism is that learners actively constructed their own knowledge and meaning from their experience.

The values on table 5 explicitly shows that there is a significant difference between student's performance with constructivist approach and those without in teaching and learning of physics for auto mechanic students. The mean value for constructivist student that is experiment and control group student centered have the values of 72.29 and 53.14 respectively which shows a significant difference having a standard deviation values of 5.00 and 6.58 respectively and t-test value of 22.01. Response to the research question four affirms to the beliefs of constructivism that all knowledge is constructed and not constructed directly perceived by the senses according to Muijs and Reynolds (2008).

### **Summary**

This research was designed to find out the implementation of constructivist approach for physics learning in vocational and technical schools in Edo state. From the research findings it is observed that constructivism could be adopted in schools as a method of teaching and learning in schools. For a proper survey of this study the following hypothesis were raised for the study to be guided.

### **Conclusion / Recommendation**

In the course of this study, it was discovered that there is a difference between learners with constructivist approach and the teacher centered students in physics learning for



vocational and technical studies in the areas of auto mechanic and electronic installation which is theory and practical based.

Based on the findings of this study the following recommendations were made:

1. It can be seen that Physics learning with constructivist approach can be used and developed as a means to improve the quality of teaching and learning in vocational high school.
2. Teachers should see the constructivist approach as a method in teaching science to enable learners grasp the scientific knowledge for optimum development in the field of scientific innovations.
3. Laboratory and workshops should be equipped with modern facilities for independency to enable the synergy of theory and practical been married together for innovation of student ideas during constructivism.

Suggestion for Further Studies

1. It is a candid suggestion from the researcher that this study should be replicated in other states with a larger sample to give room for generalization.
2. Constructivism approach for learning and teaching should also be investigated in other field of science subject to also ascertain students' performance.
3. Other variables and method of data analysis should be tried relating to this study.

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