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Effects Of 5E Instructional Strategy on Students' Academic Achievement in Physics

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ABSTRACT
The study was designed to determine the Effects of 5E Instructional strategy on Academic Achievement in Physics among Senior Secondary School Students in Katagum, Bauchi state. Quasi experimental design was adopted for the study. Stratified random sample technique was used in selecting the two schools. The population sample comprised of two intact classes with a total number of 116 students was used as sample for this study. The instruments used for data collection, are "Physics Achievement test (PAT) on Test 30 items of physics achievement test (PAT) pre-test posttest, were administered to experimental and control groups. The score obtained were analyzed using SPSS 20th version. The findings revealed that the use of 5E Instructional strategies has high significance effect on students' academic achievement It was therefore, recommended that the use of5E Instructional strategy has found effective in promoting achievement among physics students, therefore the method should be adapted in teaching physics in Katagum, Bauchi state to enhance academic achievement and enrolment of physics students in secondary school .This recommendation was made by the researcher, Physics teachers should be encouraged to use 5E instructional Teaching strategy in teaching Physics concepts at the secondary school level as it is empirically established that it enhances students' academic achievement in teaching and learning physics.
Keywords: Academic Achievement, 5E Instructional strategy, Physics, Secondary School Students

1. INTRODUCTION

Science is a systematic enterprise that builds and organizes knowledge in the form of testable explanation and prediction about the universe Sunday (2010). Science Education is a field concerned with the sharing science content and process with individuals who are not considered traditionally to be a member of scientific community; the individual could be student, farmers, or a whole community (Aina, 2015).

Physics is the branch of science that is concerned with the study of nature and properties of matter and energy (Beta, 2014). Physics is one of the subjects taught in senior secondary level of Nigeria educational system. Despite the fact that Physics plays a significant role in spurring technological developments, Physics teaching and learning in Nigeria faces many challenges. According to Tefaye (2010) there has been a low level of enrolment in Physics at the tertiary level and persistent poor score in SSCE when compared to any other science subjects.

Physics education refers to method currently used to teach Physics and to an area of pedagogical research that seeks to improve Physics teaching methodology Atadogo(2008). The methods used to teach Physics include lecture method /conventional method, demonstration and laboratory exercise among others. Physics can now be taught using 5E model Instruction.

5E learning cycle model's name comes from the number of its phases and the initials of each phase Altunay (2004). These five phases are Engage/Enter, Explore, Explain, Elaborate and Evaluate. The 5E learning cycle model is a constructivist model which provides learning a new concept or comprehension deeply a known concept. This model which increases students' merak of research, by satisfying expectations of students, consists of active research's skills and activities that are necessary for knowledge and comprehension Ergin, Ünsal and Tan, (2006). 5E model motivates students to be included into a topic by several phases of learning, to explore a subject, to be given a definition for their experiences, to obtain more detailed information about their learning and to evaluate it (Wilder and Shuttleworth, 2005). The 5 E's allows students and teachers to experience common activities, to use and build on prior knowledge and experience, to construct meaning, and to continually assess their understanding of a concept. The model are represented in figure 1.

Engage Activity which will focus student's attention, stimulate their thinking, and access prior knowledge. Here Student asks questions such as: Why did this happen? What do I already know about this? What have I found out about this? And students Shows interest in the topic.

Explore: Activity which gives students time to think and investigate/test/make decisions/problem solves, and collect information. Perform an Investigation Read Authentic Resources to Collect Information, Solve a Problem and Construct a Model.

Explain : Activity which allows students to analyze their exploration Student's understanding is clarified and modified through a reflective activity such as Student Analysis & Explanation, Supporting Ideas with Evidence, Structured Questioning, Reading and Discussion, Teacher Explanation, Thinking Skill Activities: compare, classify, and error analysis.

Elaborate: Activity which expands and solidifies student thinking and/or applies it to a real-world situation Problem Solving, Decision Making, Experimental Inquiry, and Thinking Skill Activities: compare, classify, and apply.

Evaluate: Activity which allows the teacher to assess student performance and/or understandings of concepts, skills, processes, and applications any of the Previous Activities Develop a Scoring Tool, Performance, and Assessment; Produce a Product, Journal Entry, and Portfolio,

2. METHODOLOGY

The design of the study is Quasi-Experimental. The design is illustrated in fig below.

EG O1 ⟶ X_1 ⟶ O_2

CG O1 ⟶ X_2 ⟶ O_2

Fig1 research design illustration below

Key :O_1 pre- test observation, X: Treatment, EG: Experimental group, CG: Control group O_2 posttest.

2.1 Population of the study

The population of the study comprised all public Education and co-educational senior secondary schools class SS II and I students who were offering physics in katagum local governments Bauchi state. All together there are seven single/co-Educational secondary schools in Katagum and comprised 705 students 509 males and 196 females.

2.2 Sample Size

From the population of the study, two schools were sampled for this study using the simple random sampling technique. These schools are: s GDSS Azare and GCDSS Azare respectively. The SS II students in the sampled schools served as the subjects for the study.. The two secondary schools were selected out of 7 single/ co-education secondary schools in Katagum Bauchi state. From the two sampled schools; GDSS Azare was assigned to experimental group and while GCDSS Azare a served as the control group respectively. Thus, GDSS Azare comprised of 44 male and 18 female while GCDSS comprised of 41 male students and 13 females respectively as shown in table 4. Thus, a sample of 116 students was drawn from the population of SS II Physics students for 2016 session.

Table 4: summary of the sample size

SCHOOL	SAMPLE
GDSS AZARE	62
GCDSS AZARE	54
TOTAL	116

An Independent-Samples T Test was applied to ensure that there was no significant difference between control and 5Es group on their posttest scores as shown below.

Groups	N	Mean	Std Dev	Std.Error	Z	Df	p-value	Sig
Experimental	62	38.22	3.51	.477				
					10.53	53	.000	.000
Control	54	29.00	5.10	.694				

Significant at P ≤ 0.05 Z-test analysis of posttest Physics academic achievement scores of experimental and control groups

Table 1 shows the Independent z-test analysis on the difference in the mean achievement scores of students taught with 5E instructional strategy approach (Experimental Group) and Lecture/traditional method (Control Group). The results from the analysis revealed that significant difference exists in the mean Achievement scores of students taught with 5E instructional approach (Experimental Group) and Lecture method (Control Group1). Reason being that the p-value of 0.00 is less than 0.05 alpha level of significance. Therefore, the null hypothesis which states that there is no significant difference in the mean achievement scores of students taught with 5E instructional strategy approach and those taught with lecture/traditional method is rejected. The study results suggested there were significant differences between 5Es and control group in teaching physics,

3. Finding

There is a significant difference between the treatment and the control group in the mean academic score. The 5E instructional group (experimental group) scored significantly higher than the lecture method. Therefore, the 5E instructional approach was effective on SS II Physics students in secondary school Katagum Bauchi state.

3.2 Discussion of the Result

It can be seen that the experimental group in this study were provided for meaningful learning to be occur. After the results are assessed, it is seen that there is a significant mean difference between the experimental and control group. The result from Tables 1 supports different literatures from science educationist which indicated a general improvement on students' academic achievement taught with 5E learning instruction. Studies by Pulat (2009), Cardak et al. (2008), Baser (2008), Nuhoglu and Yalcin (2006), Akar (2005), Whilder and Shuttleworth (2004), and Lee (2003) found that students' achievement improves after applying learning cycle approach which they opined enhances a long lasting knowledge and understanding of scientific concepts. They further stated that students are also more capable of applying their knowledge in other subject-related areas outside the original context. The result from this study also supported the findings by Ajaja and Eravwoke (2012) who observed that there was a significant effect on students' achievement in biology and chemistry that used 5Elearning instruction which made the understanding and internalization of the concepts taught easier.

4. CONCLUSIONS

Based upon the findings of the study the conclusion was drawn:

The students that were exposed to 5E instructional approach strategy Performed significantly better than those taught the same Physics concepts using the Conventional Teaching Method. Thus, 5E instructional teaching strategy enhances academic achievement in Physics among secondary school students in Katagum Bauchi Nigeria,

Contributions to Knowledge

This study empirically established that: The application of 5E Instruction teaching strategy is more viable in enhancing students' performance of Physics concepts among secondary school students than the Conventional Teaching Method (with 38.22 mean value for experimental group and 29.00 for control group respectively).

Limitations of the Study

The study has the following limitations;

i. The study was limited to only four concepts of Physics (Electricity, mechanics, Vector and Wave).
ii. The research study was applicable to only SSII of GDSS Azare and GCDSS Azare in Katagum local government Bauchi state.

RECOMMENDATIONS

The following recommendation were made for this study

i. Physics teachers should be encouraged to use 5E instructional Teaching strategy in teaching Physics concepts at the secondary school level as it is empirically established that it enhances students' academic achievement in teaching and learning physics.
ii. It is strongly advised that this constructivist 5E learning model be applied to the other courses of physics and that materials be prepared in order to measure the effectiveness of this model.

Suggestion for further Study

The following areas of further research are suggested in, with the finding of this research

- The study should be replicated in other science subject such as Chemistry, Biology and Mathematics.
- There is also need to conduct research in other physics topics a part from Basic Electronics, Mechanics, Vector and Waves.

REFERENCES

Aina .F. (2010) student and teachers perception of the causes of poor performance in Ogun state science secondary school Nigeria.

Aitunnay, N (2005). "Effectiveness of 5E Learning Cycle Model on Students" Understanding of Acid and Base Concepts. Unpublished Master Thesis. Middle East Technical University, Ankara.

Atadoga, M.M.& Onaolapo, M.A.O. (2008). A Handbook on Science Teaching Method, Zaria: Shola Press.

Becta (2004), *'A vision for e-learning', ferl Offline,*vol 17, Autumn, page 4. Brooks, Grennon, G. and Brooks, M. (1993), The Case For Constructivist Classrooms

Ergin, İ. (2006). An example of the effect of the 5E model on students' academic achievement, attitudes and retention levels in physics education Two-dimensional projectile motion, [PhD thesis], Gazi University, Institute of Education Sciences, Ankara.

Sunday A (2010), *the impact of information communication technology on teaching and learning physics*. International journal of education research and teaching vol1(12)2010:48-49

Wılder, M., Shuttleworth, P., (2005). "Cell Inquiry: A 5e Learning Cycle Lesson. Science Activities". Winter, Vol:41,No:4,37-43