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Effect of activity-based learning strategies on physics students' interest and academic performance in physics, in Yenagoa Metropolis, Bayelsa State

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Abstract
This study investigated the effect of activity-based learning strategies on secondary school Physics students' interest and performance in Yenagoa metropolis, Bayelsa State. Quasi-experimental pretest-posttest research design was adopted for the work. The study sample consists of 200 senior secondary school Physics (SS2) students drawn from a population of 926 Physics students using purposive sampling technique. A 20 item multiple choice achievement test titled PATHE and a 20 item modified likert scale questionnaire on titled SISALS were used to gather data from the students. The reliability of the instrument PATHE and SISALS were obtained using Kudder-Richardson formula 21 (KR21) and Cronbach's Alpha where a value of 0.82 and 0.74 were obtained respectively. Two research questions and two null hypotheses guided this work. Research questions were analyzed using mean and standard deviation, while the hypotheses were tested using ANCOVA at 0.05 level of significance. Major findings of this study showed that students taught using the activity-based learning strategies performed significantly better than their counterparts taught using the demonstration method. This study also revealed that the students' interest in Physics was aroused after they were taught with the activity based learning strategies.

Keywords: cooperative learning strategy, practical learning strategy, discovery learning strategy, demonstration method, academic performance, interest, physics

1. Introduction

It is a known fact that Physics holds a prominent position in the sciences because it is the bedrock of most science related subjects and courses. Hence students must have a credit pass in SSCE Physics to qualify to study any science related course at the tertiary level in Nigeria. The graduates of Engineering, Medicine, Geology, Architecture, Geophysics, Science Education and others, all have their foundations in Physics. Little wonder, Physics is a compulsory course of study for all science related courses at one hundred level in Nigerian universities. This is because, it is a basic component of the general education needed by every individual in today's world, as science plays a major role in influencing present societies and shaping future ones due to its relevance in our daily activities. The level of demand on manpower in the area of science and technology, are such that raising a science oriented populace is almost one without other options. Also, it is the various advantages of science and technology in terms of its impact on the development of any nation that gave rise to the efforts being made by many developed nations of the world to develop the teaching and learning of science at all level of academic pursuit. And of course, it is an obvious truth that there can never be any meaningful technological advancement and achievement in any country where its populace are scientifically illiterate, especially in Physics which stands out as the foundation of science. Friedl, 2015 defined Physics as the fundamental science which creates a foundation for other natural sciences. It is usually defined as the study of matter and energy and the interactions between them. It helps in solving societal problems, ranging from the various known environmental pollutions to maintenance of personal hygiene, generation of power, effective and efficient exploration of natural resources like crude oil as in the case of Nigeria, and other important mineral resources and the maintenance of such. It's important to note also that science in form of Physics is the basis of all technology and its advancement is a major key to both economic and social well-being as well as military superiority of any nation.

But unfortunately, despite the obvious relevance of this subject in our daily lives, students still regard it as a very difficult subject and this have had a very negative effect on their academic achievements. Nigeria Educational Research and Development Council, (NERDC), Science Association of Nigeria, (SAN), Science Teachers Association of Nigeria, (STAN), and some other government parastatals have made it a point of duty to search and experiment various means of making Physics as a subject easier, more interesting and attractive to students through the development and modification of curriculum content, working on students attitudes, introducing new and more interesting teaching methods so as to aid understanding of the subject and hence increase the rate of passing it. As stated above, the poor performance in Physics among secondary school students has been an issue of concern to all stakeholders. A report by Ojerinde (1998) in his survey of the performance of candidates in science subjects in Nigeria over the years reveals an almost predictable decline. Also, the chief Registrar/Chief Executive of the council, Prof. Promise M. Okpala decried the poor performance of students in core science subjects like Physics, chemistry, Mathematics and Biology, in May/June, 2011 National Examinations Council (NECO). He attributed the mass failure in external examination to lack of effective and quality teaching on the part of the teachers, nonchalance in terms of learning on the part of the students, among other factors. Good, effective

and quality teaching has to do with the teacher's prowess in the ability to apply the appropriate teaching methods and strategies during instruction. He added that for improved performance to be achieved, there is the need to identify the best instructional strategy in teaching contents and the intensive learning on the part of the students. Also, the national president of the Nigerian institute of Physics, Prof. David Malgwi at its 39th conference at Crawford University Ogun state raised an alarm over students' poor performance in Physics and warned that the situation must not be taken lightly but must be tackled with immediate effect. He emphasized that secondary school students' performance in Physics in WASSCE and NECO is very poor and this in turn may have a negative effect on other professions like Engineering, Geosciences, Pharmacy, Medicine, Astronomy and others (Nations Newspaper, 2016). And of course, Nigeria cannot realize her dream in the development of science and technology if its citizens do not have outstanding performance in Physics and other science subjects. It's a known fact that no nation can survive economically and compete favorably if its future generation is performing poorly in scientific fields like Physics.

Besides student's poor performance in Physics, it has also been observed that they don't have interest in studying Physics which is also among the major factors affecting their academic performance generally. The table below as obtained from WAEC office shows the declining rate of students' enrollment in Physics and the level of their poor performance in the subject.

Table 1: Performance of Students in Physics at SSCE level (WAEC) from 2014 to 2016 in Bayelsa state.

Grades in Percentage													
Subject	**Year**	**Total Entry**	**Total Sat**	**No Abs**	**A1**	**B2**	**B3**	**C4**	**C5**	**C6**	**D7**	**E8**	**F9**
Physics	2014	673781	665570	8211	1.02	1.93	3.70	7.36	12.60	17.91	10.86	20.40	21.12
	2015	665098	657827	7271	0.98	1.67	2.38	6.57	10.23	15.88	18.91	21.22	20.38
	2016	645308	640491	4812	1.14	1.48	2.19	5.10	9.54	15.11	17.70	20.34	26.63

***Source*:** WAEC Office Bayelsa, (2017).

One may want to ask why the decline in performance and enrolment rate in Physics. To this end, several researchers have attributed this poor performance and lack of interest in the subject to factors such as socoi-cultural and economic background of the students, ill-equipped laboratories, unqualified teachers and poor motivation of students' interest, inadequate instruction and many more (Haimowitz, 1989; Lawrence, 2005; Mwamwenda, 2009: Zachariah, 2012).

Physics like any other science oriented subject can be taught and learnt by various teaching methods, some by listening and some other methods are by doing. The selection of the most suitable teaching strategy is a basic condition for a successful teaching/learning process. Teaching of science requires more understanding and conceptual linkage of various scientific representation (Anis, 2016). The teaching/learning techniques must have necessary provision for students' active engagement with explanatory ideas, theories and evidence so as to enable the connection of scientific concepts to real purposes and practices in the world they live. Important to note also, is that the most recommended strategies for teaching science are problem solving, enquiry-based teaching, laboratory-based activities and project-based teaching/learning approaches also known as activity based learning strategies or innovative teaching method. But unfortunately, teachers teach classes the same way they were taught, typically using lecturing method (Mazur, 2015). This unfortunately leaves the learners to the fate of depending on rote learning without having an in depth understanding of scientific phenomenon, concepts and theories and hence losing interest in the whole phenomenon

The in-depth desire to improve effective teaching and learning in our schools in recent times that would help in boosting students' interest and motivation to study Physics has continued to form the basis for several adjustments in the curricular over the years. It is now becoming obvious to educators and curriculum planners that to achieve any meaningful change in the students, there must be a corresponding change in the educational program and instruments by exploring the activity teaching methods. Activity based instructional method are those innovative teaching methods which are in line with the constructivist and cognitive teaching and learning theories, where the learner is a major participant and active in the teaching and learning process. Prince (2015) pointed out that activity oriented learning (AOL) is a learning technique in which the students are occupied with the learning procedure. In view of Felder and Brent (2016), any instruction that does not demand students to watch, listen and take note but employ students into discovery, exploration and creativity is called active learning. This method encourages practice. It is also known as an instructional method in which students take part in instruction instead of behaving as "passive learners". Edward (2013) added that when instructors use student's experiences to demonstrate teaching, students can easily reflect on it, thus, increasing their deep understanding of the content. For Hartfield, Davis, Hede, Panko, and Kenly (2007) teaching strategy in activity oriented learning has to do with students effectively partaking in learning knowledge instead of sitting as latent members of an audience. In other words, learning activities has to do with real life experience which helps students to change information to their own understanding which they can apply when the need arise (Edward, 2013). Activity oriented learning (AOL) usually aids understanding of what is being taught, and concretizes learning by building a mental picture of what is learnt in the learner's mind as put forward by Confucius, the great philosopher; " I hear and I forget, I see and I remember, I do and I understand." Activity based teaching is majorly about students learning something through "hands on, mind on" activities.

1.1 Characteristics of activity based learning

According to Johanna (2013), activity based learning encourage production of fewer concepts in a lesson and give privilege for learner to use the concepts in a variety of learning experiences. Other characteristics are listed below:

1. Learners are active participant in the learning process
2. The teacher guides the students more than teaching them.

3. Learners are given the opportunity to think critically and rationally to arrive at a conclusion.
4. Students' exploration is usually highly emphasized and encouraged.
5. Students are allowed to construct their own knowledge based on their conclusion about a guided experience they had.

1.2 Cooperative teaching strategy

Cooperative learning strategy is one of the best procedures that empower dynamic interest in the teaching and learning procedure. It is an approach that facilitates the exploration of problem solving. Meremute (2015) clearly asserted that students showed improvement in their academic interactions and learning styles as a result of cooperative learning strategy. It creates an environment for students to be engaged in the teaching and learning process. Uloaku (2013) in his work opined that in a cooperative learning strategy, students are not really responsible for their knowledge construction unlike the collaborative method of teaching. This is of course true because in a cooperative learning strategy, the teacher's guidance is still required for the students to achieve the aims and objective of the teaching. Nwanekezi and Arokoyu 2014 defined cooperative instructional strategy as a teaching method in which students work in groups of 4 - 6 members and are rewarded in same way for performance as a group. Uloaku (2013) added that this teaching method is an excellent way to allow students to think critically without relying on anybody for answers. Cooperative learning is a technique that allows students to learn from each other and gain important interpersonal skills. It is one which enables learners to collaborate as they work in groups, express themselves comfortably and equally share ideas that would enable them complete a given task or achieve a certain learning goal. Students who are intelligent can explain problems to the less able ones thereby facilitating understanding. Previous literature suggests that group work could arouse students' learning interest, cultivate their exploring ability and creative thinking and improve their team spirit and social communication skills (Johnson & Miles, 2014).

1.3 Practical work teaching method

Appropriate practical work is a means through which the idea of constructivism is achieved. It is students' centered since students are engaged in instructional activities that challenge and extend students' insight. Practical work is carried out through task performance manipulation of science materials, and equipments, observing directly and demonstrations (Nwanekezi & Arokoyu 2014). According to Kasin (2016), the benefit of appropriate practical work is the focus on practice, after the presentation and modelling, the teacher directs structured practice, the teacher ask specific important questions and allow students to respond. Immediate feedback will be given to students, telling them what is correct and what is incorrect. After that, the teacher assigns assistance to the students, monitors the practice and continues to provide feedback.

The concept of practical work involves observing, experimenting, manipulating, tabulating, analyzing or applying by individual or small groups dealing with actual materials. This teaching strategy is not limited to a classroom called laboratory. Any environment outside the classroom that provides practical work to give first hand experiences to the learner could be regarded as a laboratory where practical work can take place. Nwanekezi and Arokoyu, (2014) added that practical work could be in form of field work or exploration of the students' immediate environment. Students can be encouraged to apply some scientific concepts to solve problems within their immediate environment, either at home or at the school. Practical work strategy also known as "hands on, minds on" learning strategy entails "that which I here, I forget but that which I do I remember", and it is very true of science. But the students will understand better when they practice or do the activities necessary to nail in the concept and this is the crux of science teaching.

1.4 Discovery learning approach

It is also known as the constructivist based approach to education. It is known as problem based learning, experimental learning or the 21st century learning. it is strongly backed by the works of Jean Peaget, Jerome Bruner and Seymour Papert. It is an approach that enable a learner to search for new information by experimenting through practice and experience which will enable a learner to draw an effective conclusion. it involves an unstructured exploration in some problem solving experiences in which the students draw conclusions from data which they gathered through various mental and physical processes such as observing, measuring, predicting, communicating, classifying, interpreting, describing, and formulating relevant questions (Nwanekezi & Arokoyu, 2014). Discovery learning approach is majorly an inquiry-based learning technique. Discovery learning approach is scientific in nature. The students need to first identify a problem, collect data, make hypothesis, analyse the data and then draw conclusion based on the results obtained from the data analysis. The learner can accepts or reject the hypothesis and make conclusion about the information. Hence, making them responsible for their own learning.

1.5 Demonstration method

Demonstration method of teaching, according to Cheta and Okoro (2014) in Uche, Awujo & Agbakwuru (2014) is used for skill learning as learners are being presented with first hand practices that makes them to react through carful observation. Deomostration could be done through visual or audio-visual. Nwanekezi and Arokoyu, (2014) defined it as a method of teaching which involves showing, doing and telling the students the points of emphasis. Students hear when they are taught, and the information imparted here could be forgotten easily. They see when the teacher demonstrates but the information imparted here could also be forgotten easily. They see when the teacher demonstrates but there may be misrepresentations or oversights in the demonstration and so the concept may not be well understood by the students.

1.6 Academic performance and interest

Academic performance shows the level at which learning has taken place in a learner. Furthermore, Academic performance could also be viewed as the increase in knowledge of a student resulting from taking part in a learning activity or event. It is commonly measured through examination or continuous assessments but there is no

general agreement on how it is best evaluated or which aspects are most important. As earlier mentioned, academic performance can be seen as students' success in meeting short-term or long-term goals in education. Similarly, Ukwuije and Kpolovia (2003) defined academic performance as overall academic performance of a learner which can be measured using a standard test to determine the extent of failure or success of a particular learner. In a way, academic performance could be considered as a major criterion to judge one's total potentialities and capabilities.

On the other hand, interest according to Lowman in onlinelibrary.com (2016) refers to a relatively stable psychological characteristics of people which identify the personal evaluation (subjective attributions of goodness or badness, judged degree or personal fit or misfit) attached to particular groups of occupational or leisure activity cluster. This simply implies that interest has to do with the learners' emotions which help to guide their assessment. In a classroom setting, interest is required to meet students' intellectual as well as emotional needs. Interest can never be imposed on an individual by external forces, however can be aroused. Students' interest in a topic holds so much power, when a topic connects with what students like to do, engagement deepens as they willingly spend time thinking, dialoguing, and creating ideas in meaningful ways. However, interest can be enhanced positively by a teacher, either through the teaching style or the emphasis while teaching can trigger students' interest on a particular topic being learnt. Once a teacher can have a grasp on what can arouse the interest of the students, teaching world be easier and this would improve the academic performance of the students. Musa cited in Oyenuaga (2013) explains that there is a very close relationship between a student's interest and his academic performance thereby producing the desired results. However, a high level of academic performance does not necessarily signify interest, other viable factors such as incentives, teaching style, individual differences, parents' academic socialization, cognitive factors, and non-cognitive factors can influence academic performance.

1.7 Statement of the problem

To many senior secondary school students, Physics is a very difficult subject. This conclusion can be attributed majorly to previous poor performance usually obtained by students at the end of their examinations in Physics. Subsequently, students tend to develop poor interest in the subject and this can be seen in the obvious decrease in the number of secondary school students going in for Sciences as evident in table 1 above. Surprisingly, this is not just a national issue but an international problem as stated by Mohammed (2014); it is an international problem that there is declining interest to study science as well as lack of enthusiasm to take Physics course in schools and colleges. To support this view, Semela (2016) also reported a decline in enrolment and graduation rates in Physics at all levels as evident in advance countries like USA, UK, Germany and Netherlands.

In Nigeria, the number of students that enroll and sit for WAEC in May/June have always recorded a mass failure particularly in Physics as reported regularly by examination bodies such as WAEC and NECO as seen on the pages of the daily newspapers and as observed by the president of Nigerian Institute of Physics (NIP) at its 39th conference at Crawford University Ogun state, who raised an alarm over the poor performance in Physics and equally warned that the situation must be tackled as a matter of urgency. He also emphasized on the poor performance of secondary school leavers in Physics in WAEC and NECO which if not checked would have a negative ripple effect on other science related professions like medicine, engineering, architecture, etc (Nations Newspaper, 2016). This recurrent rate of failure as observed by the president of Nigerian Institute of Physics (NIP), has for long been posing a lot of concern to the parents, science educators and other stake holders because this is an indication that resources invested on the students have not been able to produce a corresponding positive result on the students' performance particularly in Physics. These concerns has prompted the researcher into asking, why the decline in performance and enrolment rate in Physics, why the high rate of lack of interest in the subject? To this end, this research work seeks to investigate the effect of activity-based learning strategies on secondary school Physics students' interest and academic performance in Physics, in Yenagoa metropolis, Bayelsa State.

1.8 Aim and objective of the study

The aim of the study is to determine the effect of activity-based strategies on senior secondary school Physics students' interest and academic performance in Physics, in Yenagoa metropolis, Bayelsa State. Specifically, the objective of the study is to:

1. Determine the interest of students in Physics when the activity based learning strategies are employed for instructions.
2. Determine the effect of activity based learning strategies on students' academic performance in Physics

1.9 Research question

The research questions that guided the study are:

1. What are the effects of activity based learning strategies on Physics students' interest in Physics?
2. What are the effects of activity based learning strategies on Physics students' academic performance in Physics?

1.10 Hypotheses

The null-hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference between interest mean score of students taught with activity based strategies and those taught using the demonstration method of instruction.
2. There is no significant difference between the academic performance of students taught with activity based learning strategies and those taught using the conventional demonstration method.

2. Methodology

Quasi experimental research design of pre-test, post-test control group design was used. Purposive sampling technique was used to select a study sample of 200 Physics senior secondary two (SS2) students from a population of 926 SS2 Physics students in Yenagoa metropolis of Bayelsa state. Three intact classes were used as the experimental group, where the cooperative, discovery and practical based methods were used to teach, while the remaining one intact class was used as the control group, where the demonstration method of teaching was used to teach the students. In all, there were 150 students for the experimental

group, and 50 students for the control group. The instruments used for data collection includes a questionnaire based on students interest level on the use of activity learning strategy titled "Students' Interest Scale on Activity Learning Strategy" (SISALS) in a four point modified likert scale structured questionnaire based on the broad topic "Heat Energy" and a 20 item Physics Achievement Test in Heat Energy (PATHE) structured into four options of A to D, based on the topic "Heat Energy" too, where each question attracted a maximum of five (5) marks and a minimum of zero (0) for wrong response. The instrument was validated by two experts in the field of Curriculum studies and Educational Technology, Faculty of Education, University of Port Harcourt, and one experienced Physics teacher from one of the senior secondary schools in Yenagoa, Bayelsa state. The reliability coefficient of the instrument PATHE and SISALS was established using Kudder-Richardson formula 21 (KR21) for the PATHE and Cronbach's Alpha for the SISALS. A reliability coefficient of 0.82 and 0.74 were obtained for PATHE and SISALS respectively. The research question were analyzed using mean and standard deviation, while the hypotheses were tested using analysis of Covariance (ANCOVA).

3. Data presentation

Research Question 1: What is the effect of activity based learning strategies on Physics students' interest?

Table 2: Mean interest scores of students based on methods

Test: Interest			
Method	**N**	**X**	**SD**
Discovery Method	50	43.56	8.22
Practical work Method	50	51.56	15.35
Cooperative Method	50	48.94	15.23
Demonstration Method	50	34.76	3.25

From table 2 above, the result indicates that students taught with practical work method showed more interest in learning Physics (Heat Energy) compared to those taught using cooperative method, those taught with cooperative method had more interest than those of discovery method while those of discovery had more interest than those taught with the demonstration method of teaching.

Research Question 2: What are the effects of activity based learning strategies on Physics students' academic performance in Physics?

Table 3: Mean achievement scores of students in the activity based method and demonstration groups

Test: Achievement		Pre-test		Post-test		Mean Difference
Method	**N**	**N**	**SD**	**X**	**SD**	**X**
Demonstration Method	50	35.20	8.86	54.40	7.60	19.20
Discovery Method	50	39.60	8.56	72.30	14.65	32.70
Practical work Method	50	38.50	7.70	80.60	11.19	42.10
Cooperative Method	50	36.30	7.41	78.30	12.96	42.00

Table 3, showed that students taught Physics with demonstration method had pre-test achievement mean score of 35.20 with standard deviation of 8.86, post-test mean score of 54.40 with standard deviation of 7.60 and mean achievement difference score of 19.20, student taught with discovery method had pre-test achievement mean score of 39.60 with standard deviation of 8.56, post-test mean score of 72.30 with standard deviation of 14.66 and mean difference score of 32.70 while those students that were taught Physics with practical work method had pre-test achievement mean score of 38.50 with standard deviation of 7.70, post-test mean score of 80.60 with standard deviation of 11.19 and mean difference score of 42.10 while those students that were taught Physics with cooperative method had pre-test achievement mean score of 36.30 with standard deviation of 7.40, post-test mean score of 78.30 with standard deviation of 12.96 and mean difference score of 42.00. This result indicated that practical work is most effective and enhances students' academic performance in Physics more than the group taught with demonstration method, discovery method and cooperative method.

Hypothesis 1: There is no significant difference between mean interest scores of students taught with activity based strategies and those taught using the demonstration method.

Table 4: Summary of ANCOVA of students' interest in Physics based on methods

Dependent Variable: post-interest					
Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Corrected Model	8215.658[a]	4	2053.915	15.044	.000
Intercept	9767.485	1	9767.485	71.541	.000
Pre-interest	158.963	1	158.963	1.164	.282
Methods	7834.340	3	2611.447	19.127	.000
Error	26623.217	195	136.529		
Total	432225.000	200			
Corrected Total	34838.875	199			

The analysis shows that there is a significant difference in methods on students' interest in Physics. Thus the null hypothesis was rejected ($p = 0.001$ and $f_{3, 195} = 19.127$).

Table 5: Summary of Post Hoc Tests of Students' Interest in Physics Based On Methods

Dependent Variable: post-interest						
(I) Method	**(J) Method**	**Mean Difference (I-J)**	**Std. Error**	**Sig.[b]**	**95% Confidence Interval for Difference[b]**	
					Lower Bound	**Upper Bound**
Cooperative Method	Practical work Method	-.681	3.251	.834	-7.093	5.730
	Discovery Method	4.885*	2.337	.038	.277	9.494
	Demonstration method	14.978*	2.628	.000	9.794	20.162
Practical work Method	Cooperative Method	.681	3.251	.834	-5.730	7.093
	Discovery Method	5.567	3.260	.089	-.863	11.997
	Demonstration method	15.660*	2.565	.000	10.601	20.718

Discovery Method	Cooperative Method	-4.885*	2.337	.038	-9.494	-.277
	Practical work Method	-5.567	3.260	.089	-11.997	.863
	Demonstration method	10.093*	2.635	.000	4.897	15.289
Demonstration method	Cooperative Method	-14.978*	2.628	.000	-20.162	-9.794
	Practical work Method	-15.660*	2.565	.000	-20.718	-10.601
	Discovery Method	-10.093*	2.635	.000	-15.289	-4.897

From the analysis above, the four teaching strategies were significantly different in their effects on students' interest in Physics. Practical work method was more effective than cooperative method, while cooperative method was more effective than discovery method and discovery method more effective than demonstration method.

Hypothesis 6

Table 6: Summary of ANCOVA of students' performance in Physics based on methods

Dependent Variable: Post-test					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Correctez Model	21751.130[a]	4	5437.782	39.190	0.000
Intercept	35431.703	1	35431.703	255.358	0.000
Pre-test	648.130	1	648.130	4.671	0.032
Methods	19917.161	3	6639.054	47.848	0.000
Error	27056.870	195	138.753		
Total	1068400.000	200			
Corrected Total	48808.000	199			

Table 6 showed ANCOVA analysis showing the difference in four teaching methods; demonstration method, discovery method, practical work method and cooperative method on students' performance in Physics. The analysis showed that there was a significant difference in four methods on students' performance in Physics. Thus the null hypothesis was rejected ($p < 0.05$and $f_{1, 195} = 47.85$).

4. Discussion of findings

Table 2, vividly showed that practical work method comparatively enhanced students' interest in physics than the cooperative, discovery and conventional (demonstration) teaching method. The table also is indicative of the fact that the cooperative learning was comparatively more effective in enhancing students' interest in Physics than both the discovery and the demonstration method. Table 3 also showed that the difference was significant. The active nature of practical work and cooperative Learning impressed the students. They took interest in the discussion, analysis and problem solving of concepts in Physics. This participation increased their interest in Physics despite the nature of the concepts. Taking interest in Physics is a positive approach towards better performance in Physics performance tests. This study has proven that the students' centeredness of practical work and cooperative learning can immensely enhance the students' interest in learning some concepts in Physics which in turn will enhance students' performance in Physics generally. The demonstration teaching method has been described as uninteresting to the students and ineffective due to its teacher centeredness and relative lack of activity on the part of the students.

Also, the analysis of the results of the students' performance based on methods in Table 4, showed that practical work method is more effective and improves students' academic performance in physics more than the, discovery cooperative and the demonstration method. The analysis of covariance presented in Table 6, confirmed that there is a significant difference between the mean performance scores of students exposed to the four methods (demonstration, discovery. Practical work and cooperative method). This implies that students who are exposed to practical work method in the experimental group achieved better scores than the students who are exposed to other methods at post-test. This could be that students find it easier to understand concepts that are related to their experiences. The application of practical method aroused the interest of students, hence reinforced the learning process of students and equipped them with sufficient experiences that will enable them embark on similar experiments accurately and recall concepts and their applications during examinations and in the society at large.

4.1 Summary of findings

From the findings of this study, **t**here was a significant difference in methods on students' interest in Physics. That is, students who were taught using the cooperative learning strategy, practical work method, and the discovery method had more interest in the subject compared to their counterparts who were taught using the demonstration method. The four teaching strategies used in this research work were significantly different in their effects on students' interest in Physics. Practical work method was more effective than cooperative method while cooperative method was more effective than discovery method and discovery method was more effective than the demonstration method. Also, there is a significant difference between the students' academic performance who were taught with the activity based learning strategy and those taught with the demonstration method.

5. Conclusion

Results from the findings of this study shows that students who were taught with the activity based learning strategies had better interest in Physics and this in turn aided them in obtaining better academic performance than their counterpart who were taught using the conventional demonstration teaching method.

6. Recommendations

The following recommendations were made from the findings of this study:

1. The use of activity based learning strategies (cooperative learning strategy, practical work method, and the discovery teaching method) in the teaching and learning of Physics should be made compulsory for all Physics teachers and instructors especially at the secondary school level as its importance cannot be over emphasised as revealed by the findings of this study.
2. Physics teachers at the secondary school level should as a matter of urgency be given orientation through seminars, workshops and conferences on the importance of applying the activity based learning approach in the teaching and learning of Physics.

3. Secondary school Physics teachers should be given first hand teaching and orientation on how to apply the various activity based teaching strategies especially the practical work and cooperative teaching methods in their regular classes through in-service training and workshops.
4. Government at all levels should show commitment and support in promoting innovative teaching of Physics and other science subjects at the secondary school level by providing an enabling environment and the required facilities in secondary schools so as to make students' centred learning activities a reality.
5. The secondary school Physics curriculum should be designed in a way that its content can be delivered through activity based teaching rather than just the traditional demonstration method. That is, the cooperative teaching method, practical work, and discovery learning strategy should be incorporated into the secondary school Physics curriculum by the curriculum planners.
6. The mandatory application of the cooperative teaching method, practical work, and discovery learning strategies should be ensured through professional supervisory bodies set up by the government.
7. State government, through the ministry of education should regularly call for reappraisal to ascertain the extent of application of these strategies in the teaching and learning of Physics at the secondary level.
8. School principals and supervisory bodies should make it a point of duty to give special awards on regular bases to Physics teachers who are outstanding in the regular use and application of the activity based learning strategies in the teaching and learning of Physics.

7. Reference

1. Anis worth S. Deft: A conceptual framework for considering learning with multiple representations learning and instruction. Education Research and Review. 2016; 16(3):183-198.
2. Churchill D. Effectiveness design principles for activity based learning. The crucial role of learning objects in science and engineering education. Retrieved from gttp://www.learners together.net/pdf/effective design-principles.pdf on 29 Aug 2014, 2018.
3. Edward R. Meeting individual learners needs: power-based learning, subject, subjection. Inc. Paechter, M. Preedy, D. Scott, and J. Soler (Eds.) Knowledge, Power and Learning. London: SAGE, 2013.
4. Felder RM, Brent R. Teaching and Learning STEM: A Practical Guide, Ch.6. San Francisco: Jossey-Bass, 2016.
5. Friedl S. *What is Physics? - Definition, History & Branches*. Retrieved November 6, 2017, from Study.com: http:www.study.comacademy/lesson/what-is-physics-definition-history-branches.htm, 2015.
6. Harfield T, Davies K, Hede J, Panko M, Kenley R. Activity-based teaching for UNITEC New Zealand construction students. Emirates journal for engeering Research. 2007; 12(1):57-63.
7. Johanna K. L. (2013).Curriculum and instruction methods for the elementary and middle school 6th edition person education Inc, Upper saddle Rivers Jersey
8. Mazur E. (2015). Farewell, demonstration? Science education 323: 50-51
9. Meremute, E. B. (2015): Cooperative Learning Strategies and Academic Performance of Students in Mathematics. *Educational Research Review*. 3 (1), 33-37.
10. Mohammed I.H. (2014) Effect of Peer Group Activity-Based learning on students' Academic Achievement in Physics at secondary level, *International Journal of Academic Research*, Vol. 3. No. 1January 2013, Part 111 retrieved March 2018, from Https://www.
11. NECO (2011). Registrar/Chief Executive of the Council Annual Report
12. Oyenuaga, A. O. (2013) Effects of models on interest and Academic performance studies in technical drawing colleges in Lagos state retrieved from. http://www.unn.edu.ng
13. Nwanekezi, A.U. & Arokoyu, A.A. (2016). Science Education: Theory and Research. Port Harcourt: M & J Grand Orbit Communications Limited.
14. Prince, M. (2015). Does active learning work a review of the research: do active learning work?
15. Semela,T. (2016). Who is joining physics and why? Factors influencing the choice of physics among ethopian university students. *International journal of environmental and science education*, 5(3) 319-340.
16. The Nation Newspaper October, 27th 2016. Institute Bemoans Candidate's Poor Performance in Physics(thenationonlineng.net/institute-bemoans-candidatepoor-performaance-physics/)
17. Uloaku, E. I (2013). Teaching and Learning Physics in Nigerian Secondary Schools. The curriculum transformation, issues, problems and prospects. *International Journal of Educational Research and Technology.* Vol 1(1), Pg 99-107.
18. Zachariah, K, M, (2012). Factors Contributing to Students Poor Performance in Mathematics at Kenya Certificate of Secondary School Education in Kenya: A Case of Baringo County, Kenya. *American international Journal of Contemporary Research*.2(6), pg87-91