Enhancing Students’ Academic Performance in Physics Practicals: The Computer Simulation Experience

Ilorah Samuel O. & Adeniji Jude K.

1Department of Curriculum Studies and Educational Technology
University of Port Harcourt, Rivers State, Nigeria
ilorah07@gmail.com

2Faculty of Technical and Science Education
Rivers State University, Port Harcourt, Rivers State, Nigeria
jkentom2020@yahoo.com

ABSTRACT
This study investigated students’ performance in Physics practical through the use of Simulation Instructional Package (SIP) and Conventional Laboratory Apparatus (CLA) in Rivers State, Nigeria. The research design adopted for the study was a quasi-experimental, randomized pretest – posttest experimental design. The populations of the study comprised of all SS2 Physics students in Port Harcourt metropolis in Rivers State. Fifty (50) senior secondary 2 students (SS2) from two purposively selected Secondary schools made up the sample for the study. Two groups namely, the experimental group and control group were used for the study. The experimental group was taught practical physics using Simulation Instructional Package (SIP). Two (2) research questions were answered and two (2) null hypotheses were posited and tested at 0.05 level of confidence. The instrument used in the study was Physics practical Achievement test (PPAT). The PPAT was an adapted past WASSCE questions. The data generated were analyzed using percentage mean to answer the research questions while Analysis of Covariance (ANCOVA) and t-test inferential statistics were used to test the hypotheses at 0.05 level of significance. The null hypotheses \( H_{01} \) was rejected as a result of significant difference between the performances of students taught Physics practical using Simulation Instructional Package (SIP) and those taught using Conventional Laboratory Apparatus (CLA). Hence Simulation Instructional Package (SIP) was more effective in enhancing students’ performance in Physics practical than conventional teaching method. On the other hand and the null hypotheses \( H_{02} \) was accepted, by implication, gender does not influence the achievement of students taught Practical Physics using Simulation Instructional Package. Based on the above findings, the following recommendations were posited: There is need for teachers and physics students to use computer simulation so as to provide practical experience and conceptual understanding of physics concepts. Also trainings, seminars and workshops should be organized for the secondary school teachers on the use of Simulation Instructional Package (SIP) in the teaching of various subjects especially Physics (Physics Practical). Secondary schools should be equipped with adequate computer systems and internet facilities for effective implementation and the use of computer simulation.

Keywords: Physics education, Physics Practical and Simulation Instructional Package

INTRODUCTION
Science has developed into one of the greatest and most influential fields of human endeavor. Today, different branches of science investigate almost everything that can be observed or detected and science as a whole, shape the way we understand the universe, planet, ourselves and other living things. Science has become an integral part of human culture. Countries that ignore this significant truism are risking the potential aspiration of their future generation. It is therefore worthy to note that development of any nation depends, to a large extent, on the level of scientific education of her citizens. Physics is a science subject that deals with the fundamental constituents of the universe, the forces they exert on one another, and the effects of these forces. Till date, physics is still the most basic of all sciences, yet, it is such one with the lowest population of teachers and learners. Physics is an important subject for economic, scientific and technological development. Empirical studies from the field of Physics Education Research (PER) have
outlined essential suggestions about physics curriculum which are generally accepted and believed to widen the knowledge and increase the horizon of understanding of physics by learners.

Among the essential suggestions are:

1. The method of teaching physics should be guided discovery instead of the traditional lecture method used in teaching the subject. This was recommended due to the fact that, learning efficiency and effectiveness take place during explanation, experimentation and discussion;

2. There should be interaction between the Physics teacher and the students. In this case, it is believed that if genuine and helpful interaction exists between the teacher and students, the students will be able to inform teachers what they find difficult in Physics thereby reducing the difficulties they (students) encounter.

National education policies are geared towards creating generally scientific literate citizens. Specifically, the National Policy on Education of Nigeria clearly stated in its aims and objectives that the learner would be given opportunity to acquire basic practical skills for self – reliance and employment, Federal Government of Nigeria (2004). In realization of this laudable objective, practical activities should be an integral part of the teaching and learning of science in secondary schools because it proffers first-hand knowledge of science concepts. One thing that is certain is that science educators agree about the values of practical activities in science teaching.

Physics as a science subject is the study of physical properties of matter and its interaction with energy. It is typically an experimental subject; principles and concepts generated from physics are very useful in interpretation of natural phenomena in sciences. This means that effective practical activities in physics are important because they enable learners build a bridge between what they see, hear, handle (hands-on) and scientific ideas that account for their observations (brains-on). No meaningful physics principle or concept can be taught without adequate practical activity accompanying such presentation using appropriate practical apparatus. It is worthy of note that practical experience in science ensures student – centered learning, allowing effective interaction between the students and the learning materials.

Studies have shown that the teaching of science has virtually been reduced to the dishing out of factual information by teachers which are as a result of insufficient practical, improper conduct of practical or inadequate conventional laboratory facilities (Onwioduokit, 2013) and (Adolphus & Aderonmu 2013).

The performance of students in physics as a subject in the Senior School Certificate Examinations (SSCE) in Nigeria from 2007 to 2011 has been poor. The percentage of students that passed physics at credit levels and above (A1 - C6) had consistently being less than 50% (West African Examination Council [WAEC] Report, 2011). Poor knowledge and skills in laboratory experience are some of the factors responsible for poor performance in physics practical. Students lose more marks out of the 40% marks allocated to practical section (WAEC Chief Examiners’ report, 2007).

The WAEC (2009) report stated that “poor knowledge of subject matter, inadequate preparation and poor labelling of diagrams were some of the weaknesses that adversely affected candidates’ performance (p. 376). Over the years, students’ achievement in physics has prompted educational researchers to continuously make relentless efforts at identifying mitigating factors that might account for the observed poor performance. It is quite unfortunate that the current trend of students’ performance in physics as a result of lack of laboratories and scientific apparatus for higher rate of content retention, creativity, originality of thought and the inability to report appropriately practical activities has adversely affected student performance in physics.

The implications of the above entails students’ lack of good practical knowledge and mastery of the requirement needed in the final senior certificate examination. With all these multifaceted problems, how can Nigeria train efficient scientists, let alone promote scientific literacy in her citizens which is indispensable to development, without experimentation using the appropriate scientific tools? How can we, like Japan, Russia, the United States of America etc, separate ourselves from the nomenclature “third world country” if there are no avenues for encouraging practical activities in our secondary schools which is the platform for scientific consciousness and development? Science will remain an abstract pursuit to learners so long as they are not exposed to its real application in daily lives. Technology will never be appropriate if students are not afforded means of contextualizing it. This should earnestly begin by the use of appropriate science equipment so that the learner can establish generalization based on a particular principle or concept.

Students need practical experiences to enable them understand some abstracts concepts in physics, therefore, effective use of laboratory equipment and facilities will improve the mastery of physics concepts. However, most of the public secondary schools in Nigeria are faced with lack of laboratory or equipment, or insufficient laboratory conditions which limits the teacher to perform a simple laboratory activity. Also, the cost of carrying out experiments, arranging the equipment and laboratory activities are laborious and much time consuming. Checking students’ performance during the laboratory activities can be tasking and laborious especially when dealing with large number of students. When taking these challenges into consideration, looking for appropriate alternatives is inevitable, hence, the use of Simulation Instructional Package in supporting the laboratory methods can be a logical one.
Computer Simulations in Physics Teaching

Schools’ widespread access to Information and Communications Technologies (ICT) pose tremendous challenges to teaching and learning of Physics. Physics is one of the areas where the possibilities that computers may offer for the employment of new teaching methods have been and are still explored. A variety of computer applications have been developed and used in teaching Physics, such as spreadsheets, computer-based laboratories, multimedia, simulation. Furthermore, research has often been employed to direct educational software design and development, as well as educational software evaluation.

Today numerous ICT applications are available, aiming to stimulate students' active engagement and offering the opportunity to work under conditions that are extremely difficult, costly or time-consuming to be created in the classroom or even the physics lab. The use of such ICT applications has developed a new research field in physics education, since it radically changed the framework under which physics teaching is being understood and implemented. Among the various ICT applications, computer simulations are of special importance in Physics teaching and learning. Simulations offer new educational environments, which aim to enhance teachers' instructional potentialities and to facilitate students' active engagement. Computer simulations offer a great variety of opportunities for modeling concepts and processes. Simulations provide a bridge between students' prior knowledge and the learning of new physical concepts, helping students develop scientific understanding through an active reformulation of their misconceptions. Specifically, they are open learning environments that provide students with the opportunity to:

1. **develop** their understanding about phenomena and physical laws through a process of hypothesis-making, and ideas testing;
2. **isolate** and manipulate parameters and therefore helping them to develop an understanding of the relationships between physical concepts, variables and phenomena;
3. **employ** a variety of representations (pictures, animation, graphs, vectors and numerical data displays) which are helpful in understanding the underlying concepts, relations and processes;
4. **express** their representations and mental models about the physical world; and
5. **investigate** phenomena which are difficult to experience in a classroom or laboratory setting because it is extremely complex, technically difficult or dangerous, money-consuming or time-consuming, or happen too fast.

According to constructivist theories, learning is a social advancement that involves language, real world situations, and interaction and collaboration among learners. The learners are considered to be central in the learning process. Constructivism transforms today’s classrooms into a knowledge-construction site where information is absorbed and knowledge is built by the learner. In constructivist classrooms, (unlike the conventional lecturer, the teacher is a facilitator and a guide, who plans, organizes, guides, and provides directions to the learner, who is accountable for his own learning), the teacher supports the learner by means of suggestions that arise out of ordinary activities, by challenges that inspire creativity, and with projects that allow for independent thinking and new ways of learning information. Constructivist theories have found more popularity with the advent of personal computers in classrooms and homes. PCs provide individual students with tools like watching video lectures to build their own learning at their own pace. Computer simulations have been successfully applied from high school to university physics teaching. They have been used to diagnose and remedy alternative conceptions of velocity and confront alternative students’ conceptions in mechanics. Studies showed that simulations were equally effective to microcomputer based labs in facilitating the comprehension of concepts involving the free fall of objects.

Statement of the Problem

Physical experiments are rarely performed in some public secondary schools in Nigeria. In order to overcome some challenges associated with laboratory activities in science classes, there is need for application of computer simulation experiment to supplement classroom demonstration or adoption in the absence of functional physical laboratory. Most of the earlier studies indicate that computer simulation experiment could be an effective instructional tool for enhancing students’ performance in sciences. However, there is very little quantitative and qualitative research on the effectiveness of simulation experiment strategy for conducting physics practical; gender influence; and effect of retention with simulation and its potential as a substitute for physical laboratory activities at the senior secondary school level especially in Port Harcourt Rivers state and especially in Nigeria. At the present moment where many science laboratories are not properly functioning, incorporating computer simulation package at the senior secondary school level is desirable. Therefore, this study aimed at improving Academic performance of secondary school students in physics practicals in Port Harcourt, Rivers State, using Simulation Instructional Package (SIP).

Purpose of the study

The purpose of the study is to investigate students’ performance in Physics practical through the use of Simulation Instructional Package (SIP) and Conventional Laboratory Apparatus (CLA). Specifically, the objectives of the study are to:

1. Compare the impact of the usage of Simulation Instructional Package (SIP) and Conventional Laboratory Apparatus (CLA) on students’ performance in Physics practical.
2. Compare the effect of Simulation Instructional Package (SIP) and Conventional Laboratory Apparatus (CLA) on students’ performance in Physics practical on male and female students performance in electricity practical.

Research Questions
The following research questions were stated in conducting the research work:
1. How does the performance of students taught Physics practical using Simulation Instructional Package (SIP) differ from that of their counterparts who used laboratory (i.e conventional laboratory apparatus CLA)?
2. What are the relative effects of the usage of Simulation Instructional Package (SIP) and conventional laboratory apparatus (CLA) on male and female students’ performance in Physics practical?

Research Hypotheses
Ho1: There is no significant difference between the mean performances of students using Simulation Instructional Package (SIP) and those using the conventional laboratory apparatus (CLA) in Physics practical.
Ho2: There is no significant difference between the mean performances of male and female students in Physics practical considering Simulation Instructional Package (SIP) usage and conventional laboratory apparatus (CLA) usage.

METHODOLOGY
The study was a quasi-experimental study adopting a Randomized Pretest – Posttest experimental design. The population of the study consisted of all senior secondary (SS 2) physics students in Port Harcourt Local Government Area of Rivers State. A stratified random sampling technique was employed to obtain a sample size of 50 participants which consisted of 23 male and 27 female SS2 physics students. These students were further grouped into experimental (used Simulation Instructional Package) group and control (used conventional laboratory apparatus) group. The experimental group consisted of 27 students (13 male and 14 female), while the control group consisted of 23 students (13 male and 10 female).

Instrument for data collection
The instruments for data collection were an adapted Physics Educational Technology simulation (PHETS) and Physics Practical Achievement Test (PPAT). Physics Educational Technology simulation (PHETS), developed by the physics education research (PER) group of the University of Colorado, United States of America. The PER group prepared about 50 simulations from mechanics to electricity and thermodynamics. All are freely available and could be downloaded online from the website http://phet.colorado.edu or http://phet.colorado.edu/teacher_ideas/classroom-use.php.

The simulations used in this study were Pendulum Lab 2.03 -figure 1; Bending Light (1.03) - figure 2 and Circuit Construction Kit - figure 3. These simulation models were highly interactive, it allowed students to take part and provide instant feedback to students. They are highly visual, for example they show the movement of electrons in the circuit. The physical principle that holds in real equipment experiments also hold here. For instance, Circuit Construction Kit gives an opportunity to study the behavior of direct current circuits using virtual materials such as resistors, light bulbs, voltmeters, ammeters and batteries. Students can change resistance of the resistor or voltage of their battery source. Students can also use batteries and bulbs with or without internal resistance while the bending Light (1.03) simulation gives an opportunity to study the refraction and the reflection of light ray from a light source. Students can measure both the incident, refracted and emergent angles of the ray of light with the aid of the protractor as shown in figure 2 below. The Pendulum Lab 2.03 simulation affords an opportunity to perform simple harmonic motion using pendulum bob. Students can vary the length of the thread using meter rule and can measure accurately the time with the aid of a photogate timer and hence the period T for completing certain number of oscillations.

The simulation software was installed only on computers in the IT room that did not have class hours. Experimental group only used this room at their program. The Pendulum Lab, the bending Light (1.03) and Circuit Construction Kit simulations were made available to students in experimental group only during the scheduled time while the control group made use of physics laboratory.

The Physics Practical Achievement Test (PPAT) consists of a Physics practical question. The test items were drawn from the past Physics practical question conducted by the West African Examination Council (WAEC). The instruments had been validated by the West African Examination Council (WAEC). PHETS was subjected to a pilot test applying the test-retest method for an interval of a week to ten (10) Physics students outside the area of study. The data obtained was analyzed using the Pearson Product Moment Correlation and a reliability index of 0.81 was obtained making the instrument reliable for the study.

The Pendulum Lab 2.03 simulation (Figure 1) affords an opportunity to perform simple harmonic motion using pendulum bob. Students can vary the length l of the thread using meter rule and can measure accurately the time t with the aid of a photo-gate timer and hence the period T can as well evaluate T^2 for completing certain number of oscillations say 20 complete oscillations The result of the experiment was tabulated and a graph of length l was plotted against the period T^2. The slope of the graph was also determined. The PHET simulation software was
installed only on computers in the IT room that did not have class hours. Experimental group only used this room at their program.

After the pre-test, the researcher taught the students in the experimental group on how to use simulation. The software for the study was installed on the computers in their computer room. The researcher demonstrated how to use the simulation. They practiced the use of simulation on their own.

The post-test was administered to the experimental group to measure the impact of the independent on the dependent variable. Items for the post-test were similar to that of pre-test items. While the control group was in physics laboratory to perform the experiments, the experimental group was in the IT room to use the computer simulation to perform the same experiment.

The first question is mechanics- Simple Harmonic Motion. The students used thread, stop watch, meter rule, and the pendulum bob. In this experiment, the students varied the length $h$ of the pendulum bob, measured and recorded the corresponding time for completing 20 oscillations and hence the period $T$ of the oscillation. The result of the experiment was tabulated and a graph of length $h$ was plotted against the period $T^2$. The slope of the graph was also determined. They used Pendulum Lab2.03 simulations.

The second item on the post-test instrument was on light. The students measured the incident angle $i$ and the corresponding refracted angle $r$ using computer simulation called the bending light 02. The result of the experiment was tabulated and a graph was plotted. The slope of the graph was also determined.

The third item is on electricity. The students used the circuit construction kit simulation to perform the experiment. The students constructed the circuit, varied the resistance of the resistor $R$ and measured the corresponding voltmeter $V$ readings. With the circuit construction kit, the students can construct any direct current circuit and to measure voltmeter and ammeter readings while varying the values of the resistor.

![Figure 1: Screen shot of simulated pendulum lab.](image)
Figure 2. Screen shot of reflection of light through rectangular prism (Question 2)

Figure 3. Screen shot of construction circuit kit. (Question 3)
Procedure for Data Collection
The collection of data was systematically organized in three different phases; Pre – treatment phase, Treatment phase and Post – treatment phase.

● Pre – treatment phase: The intention of the researcher was made known to both staff and the students involved in the study. This was done to obtain co-operation from the teachers and laboratory assistance. The PHET simulation software was installed only on computers in the IT room that did not have class hours. Experimental group only used this room at their program, while the control group used the laboratory apparatus for a general pre-test.

● Treatment phase: The treatment phase involved the teaching session for both groups on conducting and reporting of Physics practical. This consisted of practical demonstrations the PHET simulation software for the experimental group and the control group using the conventional laboratory apparatus. Three (3) periods per week of 40 minutes/per period for two (2) weeks was used for the treatment phase for the study.

● Post – treatment phase: After the treatment, the TOVOL was administered to the groups as post – test.

Method of Data Analysis
Simple means, percentage and standard deviation were used for the research questions while Analysis of Covariance (ANCOVA) was utilized for the testing of the hypotheses.

RESULTS
Research Question 1.
How does the impact of the usage of Simulation Instructional Package (SIP) on students’ performance in simple pendulum practical differ from the usage of conventional laboratory apparatus (CLA)?

Table 1: Performances of students that used Simulation Instructional Package (SIP) and conventional laboratory Apparatus (CLA).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Test</th>
<th>No</th>
<th>Mean</th>
<th>Mean Gain</th>
<th>Mean Gain %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Laboratory Apparatus (CLA)</td>
<td>Pre-test</td>
<td>23</td>
<td>30.798</td>
<td>14.652</td>
<td>38.989</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td></td>
<td>43.450</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation Instructional Package (SIP)</td>
<td>Pre-test</td>
<td>27</td>
<td>34.987</td>
<td>17.136</td>
<td>57.666</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td></td>
<td>46.123</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the above (Table 1), it was shown that the students that used the Simulation Instructional Package (SIP) in conducting the simple pendulum practical had a gain of 17.136 while those that used the conventional laboratory apparatus (CLA) in conducting the simple pendulum practical had a gain of 14.652 when the pretest and posttest were compared. The percentage mean gain also revealed that students that used the Simulation Instructional Package (SIP) had a percentage mean gain of (57.666) while those that used the conventional laboratory apparatus had a percentage mean gain of (38.989). Based on the analyzed data in the above table, students that used the computer simulated experiment (CSE) in Physics practical performed better than those that used the conventional laboratory apparatus.
Research Question 2: What are the relative effects of the usage of Simulation Instructional Package (SIP) and conventional laboratory apparatus (CLA) on male and female students’ performance in simple pendulum practical?

Table 2: Showing the Performances of male and female students that used Simulation Instructional Package (SIP) and conventional laboratory apparatus (CLA).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sex</th>
<th>Test</th>
<th>Mean</th>
<th>Mean Gain</th>
<th>Mean Gain %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Laboratory Apparatus (CLA)</td>
<td>Male</td>
<td>Pre-test</td>
<td>35.108</td>
<td>12.917</td>
<td>34.974</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-test</td>
<td>46.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Pre-test</td>
<td>25.487</td>
<td>12.388</td>
<td>44.423</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-test</td>
<td>36.875</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation Instructional Package (SIP)</td>
<td>Male</td>
<td>Pre-test</td>
<td>36.038</td>
<td>20.868</td>
<td>57.432</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-test</td>
<td>54.906</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Pre-test</td>
<td>25.937</td>
<td>15.404</td>
<td>57.997</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-test</td>
<td>39.341</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result shown in Table 2 above revealed that the posttest mean values in terms of gender and utilization of Simulation Instructional Package (SIP) and conventional laboratory apparatus (CLA) were higher than the pre-test mean values. The performance gain of students that used SIP for male was 20.868 while that of female was 15.404. This indicates that male students that used SIP performed better than their female counterpart. The table also showed the performances of both male and female students that used the CLA. The male students (CLA) had a gain of 12.917, while the female students (CLA) had a gain of 12.388 indicating that the male (CLA) students performed better than the female students.

Hypotheses

H0: There is no significant difference between the mean performances of students using Simulation Instructional Package (SIP) and those using the conventional laboratory apparatus (CLA) in Physics practical.

Table 3a: Showing the Univariate analysis of mean performances of students that used SIP and CLA.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>6407.825</td>
<td>2</td>
<td>3203.912</td>
<td>67.347</td>
</tr>
<tr>
<td>Intercept</td>
<td>20971.520</td>
<td>1</td>
<td>20971.520</td>
<td>440.823</td>
</tr>
<tr>
<td>Treatment</td>
<td>300.313</td>
<td>1</td>
<td>300.313</td>
<td>6.313</td>
</tr>
<tr>
<td>Test</td>
<td>6107.513</td>
<td>1</td>
<td>6107.513</td>
<td>128.380</td>
</tr>
<tr>
<td>Error</td>
<td>3663.163</td>
<td>77</td>
<td>47.574</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>174873.000</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>10070.988</td>
<td>79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in table 3a above, the calculated $F_{1,77}$ value is 6.313 at degree of freedom of 1,77 and probability level of 0.05 against the critical value of 3.840. Since the calculated F value is greater than the table value, the null hypothesis is rejected and the alternative hypothesis is accepted. This indicates that
there is significant difference between the mean performances of students using Simulation Instructional Package (SIP) and those using Conventional Laboratory Apparatus (CLA) in simple pendulum practical.

Table 3b: showing the dependent variable; performance

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
</tr>
<tr>
<td>Conventional Lab.</td>
<td>34.124</td>
<td>0.725</td>
<td>32.690 35.558</td>
</tr>
<tr>
<td>Apparatus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Simulated</td>
<td>37.055</td>
<td>0.737</td>
<td>35.598 38.513</td>
</tr>
<tr>
<td>Experiment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on the estimated marginal means at 0.05 level of significance, table 3b indicated that the use of simulation contributed to the significant differences in their performance in Physics practical.

Ho2: There is no significant difference between the mean performances of male and female students in Physics practical considering Simulation Instructional Package (SIP) usage and conventional laboratory apparatus (CLA) usage.

Table 4: Showing the Univariate analysis of mean performances of male and female students that used SIP and CLA.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>6114.851a</td>
<td>4</td>
<td>1528.713</td>
<td>29.136</td>
</tr>
<tr>
<td>Intercept</td>
<td>3054.217</td>
<td>1</td>
<td>3054.217</td>
<td>58.211</td>
</tr>
<tr>
<td>Test</td>
<td>5853.960</td>
<td>1</td>
<td>5853.960</td>
<td>111.572</td>
</tr>
<tr>
<td>Gender</td>
<td>62.786</td>
<td>1</td>
<td>62.786</td>
<td>1.97</td>
</tr>
<tr>
<td>Treatment</td>
<td>117.717</td>
<td>1</td>
<td>117.717</td>
<td>2.444</td>
</tr>
<tr>
<td>Gender * Treatment</td>
<td>95.188</td>
<td>1</td>
<td>95.188</td>
<td>1.814</td>
</tr>
<tr>
<td>Error</td>
<td>3935.099</td>
<td>75</td>
<td>52.468</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>175852.000</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>10049.950</td>
<td>79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From Table 4, it was shown that the interaction between gender and treatment is not significant since its calculated F value is 1.814 at degree of freedom of 1.75 and probability level of 0.05 against the F1.75 critical value of 3.840. Since calculated F value is less than the F table value, the null hypothesis is upheld. This showed that there is no significant difference between the mean performances of male and female students in simple pendulum practical considering computer simulated experiment usage and conventional laboratory apparatus usage.

DISCUSSION OF FINDINGS
The findings of this study revealed that gender does not influence the achievement of students taught Practical Physics using Simulation Instructional Package. This corroborated the findings of Macmillan (2013). Macmillian found that that there was no significant difference in the mean achievement score of male students exposed to practical Physics and that of their female counterparts also exposed to practical Physics. Aina and Akintunde, (2013) revealed that there is no significant correlation between male and female performance in physics. This implies that performance of any of the gender can in no way affect the performance of the other. It means one could not predict the performance of female students from male students or vice versa; they are independent of one another. The study of Croxford (2002) is contrary to the findings of this study who believed that girls can perform better than their male counterpart because the intellectual potential of girls is an untapped labour resource for Science and Technology.

In another study, Kolawole (2007), found out that there were significant differences in the cognitive, affective and psychomotor skills of science students in respect of gender. Hyde, Lindberg, Ellis and Williams (2008) stated that boys exceeded girls in complex problem-solving in the high school years. Sainz and Eccles (2011) also discovered that boys in Spanish Secondary Schools perform better and have high self-concept of science Mathematics and computer abilities than girls.
RECOMMENDATION
In light of the findings of the study, the following were recommended;
1. There is need for physics students to use computer simulation so as to provide practical experience and conceptual understanding of physics concepts.
2. Also trainings, seminars and workshops should be organized for the secondary school teachers on the use of Simulation Instructional Package (SIP) in the teaching of various subjects especially Physics (Physics Practical).
3. Secondary schools should be equipped with adequate computer systems and internet facilities for effective implementation and the use of computer simulation.

CONCLUSION
The findings from the study indicate that students’ poor achievement in physics can be attributed to a number of reasons. First and foremost, most of the physics teachers do not have academic qualification and/or certificate in education. What this means is that these teachers may lack the pedagogical knowledge and unfamiliar with the teacher actions that support and promote student learning. Second, classroom interaction–the disposition of teachers and students during instruction dialogue, seemed to be mostly teacher-centered and tended not to support inquiry-based teaching and learning which is noted for promoting conceptual change and enhance performance. The traditional way of teaching where teacher decides on what goes on in the classroom has a limited space in the 21st century science classrooms, particularly physics.

In addition, in every academic term, teachers seem not to cover most of their teaching units or schemes of work for the term. This may have a ripping effect on student performance. The examination body, WAEC, may not know and in fact, does not consider which areas in the physics syllabus are covered and which are not. At the end of the school year, students are examined holistically on the teaching syllabus.

Using computer simulation for practical activities in the teaching and learning of physics provides the learner with new skills, increase understanding of concepts and stimulate their interest to do experiments and learn science. Observations using these kits can be clear and quickly done ensuring accurate results if appropriately utilized. Learners will be active participants in the teaching and learning process during practical classes reducing or eliminating the idea that physics is a difficult subject.

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