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Effects of Using Computer Simulations on Learners' Academic Achievement in Physics in Secondary Schools in Ainamoi Sub-County, Kericho County

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Abstract: *This research was aimed at finding out the effect of use of computer simulations on academic achievement of form two learners in physics in Ainamoi Sub-County in Kericho County. The overall students' performance in physics nationally and in Ainamoi Sub-county at Kenya Certificate of Secondary Examination level remained low over the past years. The research objectives were to determine: the effect of using computer simulation on attitude of the experimental groups towards computer simulated Physics lessons, and the difference between academic achievement of the control group and the experimental group in Physics after treatment. The study applied Quasi-Experimental Design involving Solomon-(Four) Non-Equivalent Control Group approach. Study sample consisted of 200 Form two students and 4 Physics teachers from 4 mixed day Schools sampled purposively. Data was collected using a Standardized Physics Achievement Test (SPAT) and Student Questionnaire on Attitudes towards Computer Simulated Physics Lesson Scale (ATCSPLS). The experimental groups were taught Magnetic Effect of an Electric Current using computer simulations. The two control groups on the other hand were taught the same content using conventional methods of instruction. Findings indicated that there was a statistically significant relationship between use of computer simulations and attitude towards Physics lessons (r=0.560, p=0.000). The study revealed that there was a statistically significant difference in academic achievement between the control and experimental groups (t= -7.531, df=193.338, p=0.000). It was recommended that learning should integrate computer simulations in Physics subject since they enhance positive attitude in learners and also high academic achievement.*

Keywords: Computer, Simulations**,** Achievement, Physics, Ainamoi, Kericho

1. Introduction

In order to be relevant as a nation in such an era when the entire world is interconnected through technological advancements, education must be prioritized in every human activity; the reason being that education enables an individual to become knowledgeable and develop relevant skills that enhance individual productivity and quality living (Farooq, Chaudhry, Shafiq and Berhanu, 2011). Anyanwu & Iwuamadi (2015) defined education as the process that involves the development of powers of reasoning and judgment resulting in the ability of the learner to acquire intellectual maturity for living. In order to experience a successful educational process, teachers should make use of relevant pedagogical approaches that produce quality learning outcomes (Munyaradzi, 2013). Teaching is a process that involves bringing about desirable changes in learner's behaviour so as to achieve specific outcomes (Ayieni, 2011).

Physics is a science whose backbone is experimental evidence, criticism, and rational discussion where knowledge and understanding of its concepts depends on the perception of the Physical phenomena (Ayoubi, 2018). Physics is one among the three Sciences (Chemistry, Physics and Biology) taught in Secondary Schools in Kenya and is usually made optional at the end of Form two. Physics examines the relationship between matter and the underlying forces of nature. It involves the study of laws, principles and concepts that converge all the

components of the universe and appreciates their state of orderliness (KLB, 2016). According to Ajani & Akinyele (2014), lower student- teacher ratio is better when teaching such complex subjects as Physics since it reduces the academic achievement gap between the high and low achievers. But even with such a low ratio, learner's academic achievement has remained low over the years.

Thomas (2013) opined that there are many instructional techniques but all can be categorized only into two methods of teaching and learning that is; Learner-Centered and teacher-Centered method. Learners' low academic achievement has always been associated with ineffective teaching and learning methods by teachers (Adunola, 2011). In order for the method used for teaching to be effective, Adunola (2011) argues that teachers should be conversant with numerous teaching and learning strategies that take recognition of the magnitude of complexity of the concepts to be covered. When a computer-based technology is incorporated in the learning process, it places learners in a position where they can be able to type, analyze and communicate the knowledge from basic concepts in the subject of concern (Victor, 2013).

In USA, Guy & Lownes (2015) findings showed a remarkable improvement in the academic achievement of learners taught using Computer simulation hybrid format compared to those taught using the traditional approach. Guy & Lownes concluded that computer simulation instruction method is highly effective than the traditional instructional approach. This study sample was drawn from undergraduate students who were taught for 6 years. The Guy and Lawnes research report in USA admitted that several other studies needed to be done at other levels and environments to ascertain the validity of the study. In Portugal, Computer simulations have become a very powerful teaching and learning tool that is quite accessible to most science teachers over the last two decades (Sarabando, Cravino & Soares, 2014). This 2014 Portugal report acknowledged that computer simulations create a visual and interactive kind of learning blended with dynamic models of natural phenomena; act as a virtual laboratory where experiments deemed dangerous and costly for instance Radioactivity, X-ray, Cathode rays and other electronic experiments among others can be done.

The advantages of integrating simulations in a Physics lesson, according to Sahin (2006) in Turkey, include: Computer Simulations gives learners an opportunity to observe and interact with the real world experience. This application is useful for simulating complex contents that are impractical, expensive, impossible or too dangerous to run; Computer simulation improves the level of conceptualization of Physics ideas through unlimited experience and provides tools for Scientific inquest and problem solving as well as development of skills towards hypothesis construction and graphic interpretation. In Nigeria, Computer Simulations provide learners with an opportunity to visualize comprehend and develop a high knowledge retention rate (Owulu et' al 2016; Olalekan and Oludipe 2016). This 2016 report concludes by mentioning that integration of Computer Simulations enables the learner to visualize, contemplate and explain abstract concepts and phenomena.

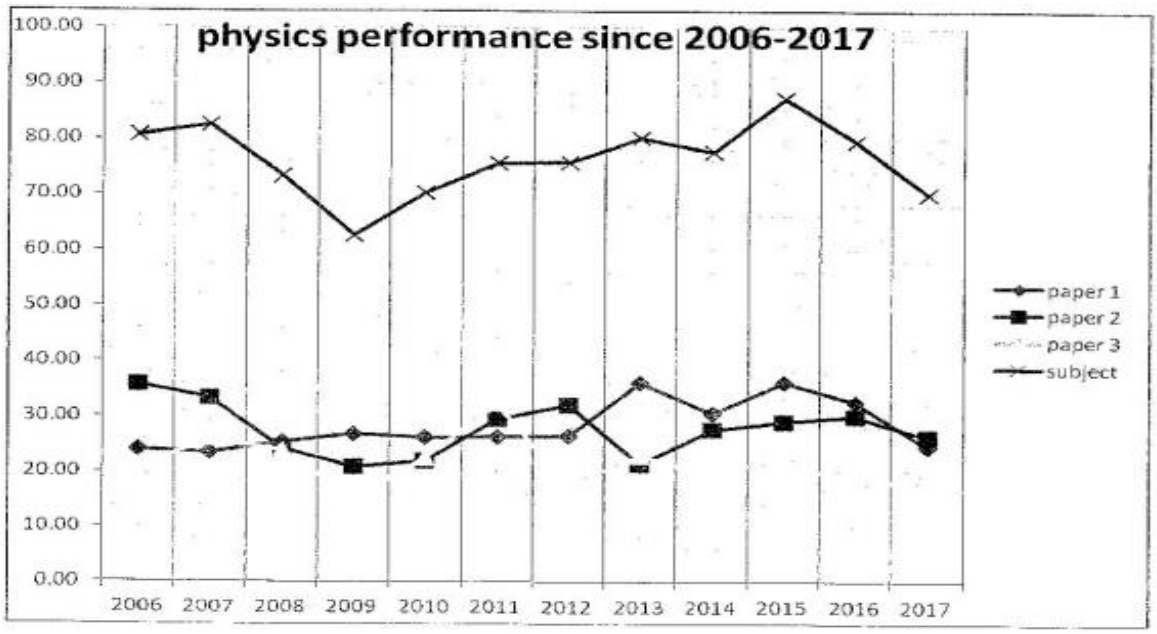
In Kenya, Thiong'o, Ndirangu and Okere (2014) argued that Computer Simulations present animated and coloured graphical images of the dynamic nature of physics concepts. In West Pokot Chesitit (2015) recommended that technology skills to be integrated with the other instuctional appraches during secondary school curriculum process and that the Ministry of Education (MOEST) to fast track their strategies in resource mobilization and digitization of curriculum content.

According to Kirimi (2014) in Kenya, ICT was mainly used for the facilitation of clerical activities, processing of examinations, timetabling and keeping student records. According to Kirimi, ICT is yet to be infused into the curriculum. The most common among the factors which have been identified as contributing to the persistent low enrolment and poor level of academic achievement in physics are the teaching methods adopted by physics teachers (Thion'go, Ndirangu,Okere, 2014). Table 1, Figure 1 and Table 2 shows Candidates Performance Statistics in the Kenya Certificate of Secondary Education Physics Examination between 2013 and 2017 nationally and in Ainamoi respectively.

Table1: Candidates' Performance Statistics in the Kenya Certificate of Secondary Education Physics Examination between 2013 and 2017 Nationally

Year	Paper	Candidature	Maximum score	Mean score	Standard Deviation
2013	1		80	36.03	19.66
	2		80	21.34	14.37
	3		40	22.85	7.98
	Overall	119,819	200	80.20	38.07
2014	1		80	30.41	17.24
	2		80	27.62	16.15
	3		40	19.68	6.78
	Overall	131,410	200	77.68	37.30
2015	1		80	36.01	17.81
	2		80	28.92	15.98
	3		40	22.71	7.62
	Overall	139,100	200	87.36	37.58
2016	1		80	32.49	19.3
	2		80	29.91	19.19
	3		40	17.15	6.56
	Overall	149,790	200	79.53	42.40
2017	1		80	24.57	15.82
	2		80	26.22	18.22
	3		40	19.33	8.33
	Overall	160,182	200	70.09	39.59

Source: KNEC Report 2017



(Source: KCSE Report 2006 to 2017)

Figure 1: Screen shot of a graph showing KCSE Performance Trends Since 2006

Table 2: Performance in Physics between 2013 and 2017 in Ainamoi Sub-County, Kericho County at Kenya Certificate of Secondary Education Level

YEAR	2017	2016	2015	2014	2013
KCSE	4.0789	4.2301	5.1114	6.4980	5.6707

Source: KNEC Report 2018

1.1 Statement of the Problem

Physics, through industrialization, remains to be a major economic contributor in most developing countries. According to Kangangi (2017), reduced pupil-teacher ratio improves learner's academic performance. Physics is an optional subject in secondary school curriculum and as such due to high learner-teacher interaction; the academic achievement is expected to be higher. But even with such a low ratio, learner's academic achievement has remained low over the years. However in Kenya, learners have registered a low academic achievement in Physics, both nationally and in Ainamoi, over the years as shown in Table 1. Low academic achievement in Physics is due to; learner's attitude towards the subject, inadequate and expensive instructional resources and poor instructional methods, which lead to poor content mastery (Olasimbo & Rotimi, 2012). Computer simulation produces statistically significant results on academic achievement of learners in different subjects and topics in secondary schools (Ezeudu & Ezinwanne, 2013). Simulation provides active participation and manipulation of materials which make the lesson more meaningful but unfortunately there is little research conducted on how this approach affects learners' academic achievement in physics in Ainamoi in Kericho. The current research explored this knowledge gap.

1.2 Objectives

The study sort to achieve the following objectives

i. To determine the effect of using computer simulation on attitude of the experimental groups towards computer simulated Physics lessons
ii. To determine the difference between academic achievement of the control group and the experimental group in Physics after treatment.

1.2 Theoretical Framework

This research was founded on Jean Piaget's (1896-1980) theory of cognitive development which is the core part of

the broader theory of constructivism. It is a theory which believes in learners constructing ideas and knowledge about their learning environment through experience (Hinde & Perry, 2007). According to Adagideli (2013), Piaget's theory highlights learning process revolves around active learning, collaborative learning, critical and creative learning among others, where the learner interacts with the real world. The learners, according to Piaget, are considered to be active as opposed to the traditional teacher-centered approach where learners are passive and perceived to be empty slates ready to be filled with facts by the teachers. Teachers therefore have the responsibility of raising the learner's attitude and confidence, motivation and skills to almost his/her status. This enables them to work collaboratively, actively participate, become creative and develop critical thinking skills. The responsibility of the teacher, according to Piaget, is to facilitate, mentor and even coach and this is what describes a teacher in the current research. The theory advocates for learner-centered instructional methods as mentioned earlier, which according to Piaget, has a direct influence on learner's attitude towards learning. This motivated the quest to explore attitude of learners towards use of computer simulation in Physics. Piaget argued that instructional technologies that motivate an interactive learning environment such as; multimedia, hypermedia, and virtual reality should be considered. Virtual reality is similar to computer simulation in the current research. This informed the current research on establishing the effect of computer simulation on learner's academic achievement in form two Physics. One of the key stages of cognitive development advocated by the theory is abstract thinking stage (11 years and above), here the learner is able to think critically and give a concrete judgment of an abstract situation. This is the most significant stage to the current study since the target population comprised of ages 14 years and above.

2. Literature Review

2.1 Effect of Using Computer Simulations on Learner's Attitude towards Computer Simulated Physics Lessons

Attitude refers to disposition, way of feeling, mental state or behaving towards someone or something (Iwuanyunwu, 2016). Makanda (2015) defined attitude as a way of thinking or feeling about something or somebody usually reflected in an individual's behaviour when he/she reacts towards or against some situation, person or object in a particular manner. In India, Kattayat, Josey & Asha (2016) found out that there was a statistically significant relationship that existed between learner's academic achievement in Physics, use of computer simulations and attitude towards Physics lessons.

The study futher recommended that teachers may integrate simulations during their curriculum implemetation process so that their students develop positive attitude toward physics. These finding in India were achieved through Pearson 'r' correlation. Cirgic & Ergul(2009) in Turkey investigated the effect of simulation based teaching on the student achievement and attitude in electrostatic induction. The study considered a control (2 class, 57 people) and experiment (2 class, 59 people) groups. During the 5 lesson period, experiment group were held with the simulation. Cirgic and Ergul found out that simulations had improved students' success on the subject of induction and that there was no significant effect on students' attitudes in this study.

Acoording to Oymak & Bekiroghu (2017), the findings of a true experimental design on 144 ninth grade students studying in an all-boys state high school in UK showed significant differences between the treatment group and control group. Oymak & Bekiroghu noted that when technology or laboratory approach was embedded in the instruction, the students became better learners and their attitudes increased. The results of this 2017 UK report presented no significant differences between the experimental groups. The sample of 144 ninth grade learners formed two experimental classes and one control class. Data was collected in the physics lessons. Force and Motion Achievement Tool was used to assess conceptual learning of learners. This test was applied before and after the treatment with an eight-week time difference. Physics Lesson Attitude Scale was also used to determine the attitude of learners towards physics lessons. Effect sizes were calculated for the changes in students' knowledge and attitudes. Only one teacher handled the three classes during data collection.

In Malaysia, Murugan & Osman (2018) used Quasi-Experimental design on 147 Malaysian upper secondary school students who formed four streams. Data was collected using Attitude Towards Chemistry Lessons Scale (ATCLS). The findings cited;no statistically significant difference between the outcomes of learning using Virtual Laboratory and Physical Laboratory on attitude of group and by gendertowards Chemistry. Murugan & Osman finally concluded that though there was a slight improvement on the mean score, use of VLab in chemistry experiments succeeded to change the attitude of learners towards chemistry. In Nigeria, Iwuanyunwu (2016) foundout that; (i) there was a statistically significant difference between the mean scores of the experimental group when taught microorganisms using simulation game strategy and their counterparts in the control group when taught using lecture method. (ii) There was a statistically significant difference between the attitude change of the students before and after exposure to simulation game strategy. The study employed Quasi-experimantal design on 153(94 males and 59 females) participants and sampling was done using stratified random sampling technique.

Al-Hasan, (2018) examined effect of use of VLab on learners motivation and attitude towards Chemistry. The findings of the experimental design clearly showed that use of Virtual lab enables learners to develop positive attitude towards Chemistry and that learning motivation scale wasto the advantage of the experimental group. Al-Hasan's sample was constituted from second-grade students of Almutamaar boys secondary school in Omdurman in Sudan.

Use of computer simulations eliminates misconceptions in Chemistry and which would otherwise lead to negative attitude, poor cognitive development and low academic achievement (Mihindo,Wachanga & Anditi, 2017). The study identified choice of appropriate instructional approach as a factor that contributes to low academic achievement and negative attitude towards the subject. This qualified the quest for a teaching/learning strategy that would enhance effective learning and development of positive attitudes.

2.2 Comparison between Academic Achievement of the Control Group and Experimental Group

In USA, Guy and Lownes (2015) noted a significant difference in performance of learners taught using Computer simulation hybrid format and those taught using the traditional approach; The study concluded that computer simulations is more effective compared to the latter. This study was limited to undergraduate students taught for 6 years. The research report admitted that several other studies needed to be done at other levels and environments to ascertain the validity of the study.

According to Teke, Dogan,& Duran (2015) in Turkey, Computer Simulations registrered a positive influence on the academic achievement for the treatment group of learners in 7th grade. Findings also revealed that the training given using simulation method showed positive outcomes to the advantage of the learner.

Riaz, Naureen & Morote (2016) investigated how simulated class managementpredicted Learner's academic achievement in Physics. The 2016 study, Physics Education Technology (PhET) simulations was used as an instruction approach for one year by 82 physics teachers in New York secondary school in USA. The findings indeed indicated that there a relationship between simulated class management and learners academic achievement in Physics existed. The study further recommended that Simulated class management should be utilized for better academic achievement in Physics.

Kroothkaew & Srisawasdi (2014) investigated use of simulation-based inquiry with dual-situated learning model to teach refraction of light in Physics. The results were that the treatment groupperformed better than their colleagues in the control group during pre-test. These findings suggested that this method could be used to help students learn science concepts in a more meaningful and understandable way in Thailand. In United Arab Emirates (UAE) Aoude, (2015), Alrsa'i & Aldhamit (2014) were of the same school of thought that teaching Uniform Cicular Motion and Electromagnetism in Physics using Computer Simulations givesbetter learning outcomes. According to the 2015 and the 2014 studies, the outcomes were attributed to the fact that Computer Simulations allowed for the presentation of information in multipple designs for instance graphs, motion, charts, figures among others. Such specific output reveals the existing relationships between the theoretical concepts laws and principles of Uniform Circular Motion and Electromagnetism.

In Nigeria, Kumar (2018) used quasi-experimental design on a sample of 219 senior secondary Physics to investigate effects of computer simulations on academic achievement in physics. The findings indicated that experimental group (Computer Simulations) had a higher mean in both the achievement and acquisition of practical skills than their counterparts in the control group (Conventional Teaching Method). These outcomes according to Kumar indicated that Computer Simulation strategy was superior over conventional instructional approach since it enhance the learner's achievement in acquisition of skills and practical Physics.

In Kenya, Mihindo, Wachanga & Anditi (2017) found out that Computer-based Simulations (CBS) in Chemistry caused a positive and significant contribution to the understanding of chemistry concepts and principles as reflected by the higher performance of students taught using CBS than their counterparts in the control group. There is need therefore for similar studies to be done on other topics in Physics and in other parts of the country.

3. Methodology

3.1Research Design

Quasi-Experimental research design involving Solomon Four Non-equivalent Control Group Design was applied in the study. Charagu (2015) highlited that quasi-experimental research focuses on the possible influence an independent variable causes on the dependent variable upon manipulation. Solomon Four Non-equivalent Control Group Design was preferred since it is extensively rigorous and appropriate for experimental studies (Fraenkel & Wallen, 2006).

Experimental Group I	O_1	X	O_2
Control Group II	O_3	-	O_4
Experimental Group III	-	X	O_5
Control Group IV	-	-	O_6

Figure 2: Solomon Four Non-equivalent Control Group Design

Key: O_1 and O_3 are pre-tests while O_2, O_4, O_5 and O_6 are post-tests

X is the treatment.

Experimental Group I will receive pre-test, treatment X and post-test.

Control Group II will receive pre-test and post – test.

Experimental Group III will receive the treatment X and a post-test

Control Group IV will receive post–test only. Control Groups II and IV will be taught using the conventional methods. The experimental group was then taught using PhET simulation on Magnetic Effect of Electric Current, while the control group was taken through the same concepts using the conventional method. The teaching was done by the regular Physics teachers from the sample schools. The teaching and learning took place for three weeks. Opinions of the experimental group were gathered after the application of computer simulation using Student Questionnaire (SQ) known as Attitude towards Computer Simulated Physics Lessons Scale (ATCSPLS).

3.2 Target Population, Sampling procedures and Sample Size

The study targeted Ainamoi Sub-County, which is home for 15 mixed day public secondary schools. The current study targeted a population of 854 form two students and 18 Physics teachers. From the target population given, 4 schools, 200 students and 4 Physics teachers were purposively sampled. Two schools were also purposively assigned to be experimental centers while the remaining two as control centers.

Table 3: Sampling Grid

Type of Secondary school	Schools		Physics Teachers		Students					
	Total	Sample	Total	Sample	Total Population	Sample				
						Experimental		Control		
Mixed Day	15	4	18	4	854	Boys	Girls	Boys	Girls	Total
						54	46	56	44	200

3.2 Data Collection Instruments

Standardized Physics Achievement Test (SPAT) was used to collect quantitative data. Experimental group I and Control group II sat for SPAT made up of 40 test items (pre-test) before treatment. The experimental group was then taught Physics using computer simulations.
Control groups were also taught the same topic but using the conventional methods.
Computer simulations were obtained from http://phet.colarodo.edu/en/simulations designed by Colorado University's Physics Education Technology (PhET). All the participants sat for a Post-Test (SPAT) as guided by the research design after treatment. SPAT was well supervised and also marked objectively using a similar marking scheme for purposes of fairness.
The current study used Karl Pearson's Coefficient of correlation formula to test the significance of the study. Student Questionnaires (SQ) known as ATCSPLS was used to collect data on learner's attitude after the post-test. This was intended to reveal the opinions of the experimental group after treatment.

3.4 Data Analysis

Quantitative data from the learner's test scores was first cross-checked (by confirming whether all questions were

marked and all scores totaled accordingly) to eliminate errors before being analyzed using descriptive statistics that is; Mean, Percentages, Standard Deviation and frequencies. Inferential statistics in the form of: t-test, and One-way Analysis of Variance were also applied with the help of SPSS for Windows. Data analysis was done at significance level of alpha equal to .05. Karl Pearson's Coefficient of correlation (or simple correlation) formula was applied to test level of statistical significance of the study.

4. Results and Discussion

4.1 Effect of Using Computer Simulation on Attitude of the Experimental groups towards Computer Simulated Physics Lessons

Solomon Four Square Design was employed in this study whereby 200 students in 4 mixed secondary schools were involved. All students (100%) completed the study. In the four selected secondary schools, students were randomly selected into four groups namely, Experimental Group I (E1), Control Group II (C1), Experimental Group III (E2) and Control Group IV (C2) as shown in Table 4.

Table 4: Intervention Design

Groups	Pre test	Treatment	Post-test
E1 (n=52)	X	X	X
C1 (n=47)	-		X
E2 (n=48)	-	X	X
C2 (n=53)	X		X

There was a need to determine whether pre-test had an effect on the post-test. The two independent groups which were pretested were E1 and C2. One-way Analysis of Variance was computed to find out if their means were significantly different.

At the end of the experiment, the experimental group (E1 and E2) were asked to participate in a survey to assess their attitude towards Physics lesson. Student Questionnaire (SQ) known as Attitude towards Computer Simulated Physics Lessons Scale (ATCSPLS) was used to gather information on attitude. The tool rated students' satisfaction statements on the use of computer simulations to teach Physics on a 5-point Likert scale. The scale ranged from strongly disagree (1 point) to strongly agree (5 points).

The first twelve questions addressed the students' views on the use of computer simulations while the last six questions addressed students' attitude towards Physics lessons.

(a) Descriptive statistics

The views of the students concerning the use of computer simulations in Physics lessons were summarized in Table 5.

Table 5*:* Satisfaction in the use of Computer Simulations Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Use of Computer Simulations	100	42.00	57.00	51.6000	2.78524
Valid N (list wise)	100				

Table 5 shows that the mean was 51.6 (SD=2.785) out of a possible score of 60. This indicated that students were highly satisfied with the use of computer simulations to teach physics.

Summaries on students' attitudes towards Physics lessons were obtained and presented in Table 6.

Table 6: Attitude towards Physics lessons Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Attitude towards physics	100	21.00	27.00	25.1300	1.28437
Valid N (list wise)	100				

Table 6 indicated that the mean score was 25.13 with a minimum of 21 and a maximum of 27. The maximum score possible for the six items was 30. It was concluded that a high number of students who were taught using computer simulations had positive attitude towards Physics lessons.

(b) Inferential statistics

Pearson Moment Correlation Coefficient was used to test the null hypothesis.

H_{01} There is no statistically significant effect of use of computer simulation on learner's attitude towards computer simulated Physics lessons.

Table 7: Computer simulations and attitude towards Physics Correlations

		Use of Computer Simulations	Attitude towards physics
Use of Computer Simulations	Pearson Correlation	1	.560**
	Sig. (2-tailed)		.000
	N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7 shows that there was a positive and statistically significant relationship between use of computer simulations and attitude towards Physics lessons (r=0.560, p=0.000). Descriptive statistics indicated that there was high satisfaction in the use of computer simulations to teach physics as indicated by a mean of 51.6 out of a possible 60. High number of students who were taught using computer simulations had positive attitude towards Physics lessons as indicated by their mean score of 25.13 out of a score 30.

The test of the null hypothesis using Pearson Moment Correlation Coefficient indicated that there was a positive and statistically significant relationship between use of computer simulations and attitude towards Physics lessons (r=0.560, p=0.000). The null hypothesis was therefore rejected. This means that increased use of computer simulations in Physics lessons led to improvement in attitude of learners towards Physics lessons.

The results are in agreement with the findings by Kattayat, Josey & Asha (2016) who found out that statistically significant relationship existed between use of computer simulations and attitude towards Physics lessons. In addition, Banik & Biswas (2017) found similar results in exploring the effect of computer-assisted instruction on student academic achievement in general science. Relatedly, there is an agreement with the findings by Oymak & Bekiroghu (2017) who noted that when technology or laboratory approach was embedded in the instruction, the students became better learners and their attitudes increased. The findings concur with those of Mwamba, George, Moonga & Pondo (2019) that use of Phet simulations produce a significant positive attitude in learners towards Electromangetism.

4.2 Difference in academic achievement between the Control and Experimental groups

The two groups received similar Physics test (post-test) which was then analyzed to give both the descriptive and inferential statistics.

(a) Descriptive statistics

A comparison between the groups' post-test scores was done to obtain their means and standard deviations. Table 20 shows that the control group had a mean of 38.79 (SD=14.55) while the experimental group had a mean of 55.65 (SD=17.01). This indicated that the experimental group performed better compared to the control group.

Table 8: Control and Experimental Groups Descriptive statistics

	Type	N	Mean	Std. Deviation	Std. Error Mean
Post Test	Control	100	38.7900	14.54863	1.45486
	Experimental	100	55.6500	17.01418	1.70142

(b) Inferential statistics

The difference between control and experimental means in Physics scores was tested to find out whether they were statistically significant or not. Independent samples t-test was used to carry out the test at 95% Confidence Interval. The following null hypothesis was advanced to allow for this test.

$H_0$2 There is no statistically significant difference between the academic achievement of the control group and that of the experimental group in Physics.

The results were presented in Table 9.

Table 9: Control and Experimental Groups Independent Samples t-test

		T	Df	Sig. (2-tailed)
Post- Test	Equal variances not assumed	-7.531	193.338	.000

The results in Table 9 confirmed that there was a significant statistical difference in academic achievement between the control and experimental groups (t= -7.531, df=193.338, p=0.000). The null hypothesis was therefore rejected. The academic achievement of the experimental group was attributed to the fact that Computer Simulations enables the learner to visualize, contemplate and explain abstract concepts and phenomena as noted in Owulu et' al (2016) and Olalekan & Oludipe (2016).

The findings were in line with those of Guy and Lownes (2015) who found a significant difference in performance of learners taught using Computer simulation hybrid format and those taught using the traditional approach. Those taught using computer simulations were more effective compared to the latter. Moreover, it confirms the findings by Teke, Dogan, & Duran (2015) that those taught uisng computer simulations registrered a positive influence on the academic achievement. Mwamba, George, Moonga & Pondo (2019) also found out that use of Phet simulations yield a significant positive impact on Learner's performance in Electromagnetism. Use of Computer Simulations leads to higher mean in both achievement and acquisition of practicals skills among the experimental groups (Kumar, 2018).

5. Conclusion and Recommendations

5.1 Conclusion

The findings indicated that use of computer simulations led to improvement in attitude of learners towards Physics lessons**.** Computer simulations help to make lessons delivery interactive hence enable learners to develop a positive attitude towards the subject. These simulations allow for adequate subject mastery, hence equip learners to answer questions correctly especially in examinations. It was established that computer simulations led to an improvement in academic achievement as compared to those taught using conventional methods. Academic achievement in science subjects cannot be substituted since it is the bedrock of most courses which are needed in every economy. Computer simulations make learning more enjoyable and enhance understanding of concepts that are abstract as opposed to traditional methodologies.

5.2 Recommendations

i. Deliberate efforts should be undertaken to integrate computer simulations in Physics lessons.
ii. Similar research should be conducted in secondary schools in other counties in Kenya so as to provide more local findings for comparison purposes.
iii. A survey study should be carried out to find out the extent of the use of computer simulations in teaching science subjects in secondary schools.

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