

The Effects Of Computer Simulation On Learners' Academic Performance In Physics In Selected Secondary Schools In Kangundo Sub-County

ABSTRACT

Academic performance of physics in secondary schools is lower compared to other subjects and some of the mentioned possible reason was due to teacher's pedagogical approaches. The study was conducted in Kangundo sub-County, adopting nonequivalent group pre-test post-test quasi experimental design. It targeted 1560 Form one physics students and 31 physics teachers. The data collection tools were; the Standardized Physics Achievement Tests, Teacher and Student questionnaire. Content validity of research instruments were achieved through expert judgment by university supervisors while reliability of the tools was achieved through test-retest technique. The sample size of 130 students in 3 selected schools taught with computer (experimental group) and 130 students in 3 selected school without computer (control group) were selected as respondents. Both descriptive and inferential statistics were used to analyze data in this study. Preliminary quantitative data was analyzed by calculating the mean, standard deviation and the percentages. The researcher also applied t- test, and chi-square for quantitative data. From the data collected, majority of respondents agreed that there were enough computers for use in the school. For the statement that all students have equal chance of use of computers, majority of the learners disagreed but teachers however strongly agreed with the same statement ($\chi^2 = 16.34$, $df=1$, $p= 0.0003$). On the statement that the instructional method used has made Physics topic easy, majority of the learners and teachers agreed. Pretest

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results showed no significant mean difference meaning that the two groups were equivalent in ability. Pretest results for the control group in extra county school mean mark was 9.33 ± 0.49 while the pre-test extra county experimental group was 9.16 ± 0.05 with no significant difference ($p=0.0899$). Similarly, private as well as the County Secondary schools showed no significant difference. For post-test control group, extra county school mean mark was 10.16 ± 3.05 while post-test experimental group extra county school was 13.80 ± 0.06 with a significance difference ($t=-15.1425$, $p=0.0043$). For the private secondary schools, the mean mark for control group post-test was 8.36 ± 0.57 while the post-test experimental group of the same was 10.43 ± 0.19 with a significance difference between the two ($t=-43.6394$, $p=0.0005$). For the county secondary school, the mean mark for control group post-test was 6.37 ± 0.38 while post-test experimental group was 7.31 ± 0.38 with a significance difference between the two ($t=-22.1560$, $p=0.0020$). It was extrapolated that computer simulation was suitable method for enhancing learners' academic performance in physics than the conventional method of teaching. The researcher recommended that the Computer simulation method be adopted by physics teachers in delivering physics concepts thus improving students' performance.

Introduction

The engagement with pupils that facilitates their understanding and application of knowledge, concepts, and practices is known as teaching. It entails design, selection of the subject matter, delivery, assessment, and reflection (Jaiswal, 2019). On the other hand, learning is described as the process of



acquiring knowledge or abilities through study, practice, instruction, or personal experience (Alam, 2022). An instructional process is made up of teaching and learning activities that are specifically designed to transfer desired knowledge, skills, and values over a certain period of time in order to improve learners' achievement in the subject matter. It takes into account students' academic success, how well they use the time allotted to them, and how actively they participate in the session.

Physics is a science subject taught in Kenya and other parts of the world (Otieno, 2019). In Kenya it is compulsory in form 1 and 2 and is optional to form 3. Physics was taught by conventional methods then after sometime it evolved to computer and it is still advancing with new technology. Physics is well taught when the learners are using their senses of hearing and seeing because by seeing the learners remember hence retaining the knowledge more but by hearing they may forget what they learnt (Model, 2022).

Performance of physics in secondary schools is lower compared to other subjects and some of the mentioned possible reasons is due to learners' negative perception towards physics subject and teacher's pedagogical approaches (Amunga et al., 2011). It has further been pointed out that teacher centered approaches has negatively affected learning of physics. There is therefore a need for a paradigm shift to student centered pedagogical approach and simulation is one of the techniques that is found to enhance achievement among learners in mathematics, technology and home science subjects in Kenya (Sifuna, Manyali, Sakwa & Mukasia, 2016). Mang'eni (2018) documented that physics was having low enrolment and it is a major setback for its benefits since it is a core subject in modern world. Computer simulation is reported to enhance learners' performance however, it is not known the extent to which it affects learners' performance.

Performance in Physics in Kenya has ranged from moderate to below average and Kangundo sub-county is

not exceptional. For example, there has been continuous poor performance in physics country wide in the available data for 2016-2018 from Kenya National Examination Council (KNEC) reports. Paper 1 of physics exam has also been declining throughout these years. The researcher chose one topic set in paper 1 which helped conduct this study with an aim to counteract this failure. Teacher centered approach was presented by Guloba, Wokadala and Lawrence (2010) to be the most cause of low grades in physics in national exam. Oladejo, Ojebisi, Olosunde and Isola (2011) also echoed that there was poor performance in physics and that over the years, secondary schools physics test scores have been dropping. All these arguments pointed to the requirement for instructional process which the study sought to answer.

Ayiema, Mwoma and Aouko (2019) determined that teachers with positive attitude towards science were found to use instructional resources more effectively than the negatives ones. According to Njiru and Karuku (2015), learner factors also contributed to the poor performance. Computer simulated models were therefore found to encourages individualized learning which leads to changes in learners' prior knowledge (D'Angelo, Rutstein, Harris, Haertel, Bernard & Borokhovski, 2014). Computer simulations is a powerful learning tool that actively involved learners in learning hence enhancing performance as compared to learning through listening and reading (Erhel & Jamet, 2019). Simulation also presented opportunity for learners to see situations that were not necessarily visible (Smetana & Bell, 2012).

Hakeem (2001) documented how students performed business statistics course while using simulation method. In his finding, he noted that those using simulation performed better than those who didn't use the method. Similar ideas are echoed by Kreber (2001) who argues that simulation as a technique of teaching promotes critical thinking abilities and self-directed learning among learners. Rocha (2019) in his study of

star formation confirmed the advantages of simulation method of teaching and learning geography by providing how the engaged students perceived themselves. This establishes that students who learn through simulation process were able to perceive themselves as more competent to their peers who did not have an opportunity to be taught through this method.

Alenezi (2019) advanced that simulation affects the quality of instruction and how well students learn. He discovered that simulation improved both teaching effectiveness and student learning outcomes. He then recommended that teachers and students in Saudi Arabia should adopt simulation technique to enhance their classroom outcomes. Smetana and Bell (2012) presented a case that computer simulation may be used to complement conventional training in science classes to improve student subject understanding and induce conceptual shift by allowing students to view scientific phenomena that are difficult to precisely observe in real life. Nyamu, Gatere and Kithinji, (2018) affirmed that in nursing education in Kenya medical training, simulation presented to be a positive method of teaching and learning. Mihindo, Wachanga and Anditi, (2017) also confirmed the same in chemistry subject in Kenyan schools. This study therefore intended to establish if the same can be applied in teaching physics.

Kenya National Examination Council (KNEC) 2018 physics reports have indicated poor performance for the previous four years in the physics course nationwide. This location was ideal for the study since it showed continuous poor performance in physics subject as evidenced in KNEC physics report of 2018. The area was chosen for the study because the indigenous people living in Kangundo are of Akamba ethnicity however, due to the proximity to Nairobi, the area was highly inhabited by other communities making it cosmopolitan. It was asserted that poor performance in physics subject was attributed to the way physics concept was delivered in class. Musasia, Ocholla and Sakwa, (2016) presented that lecture method was



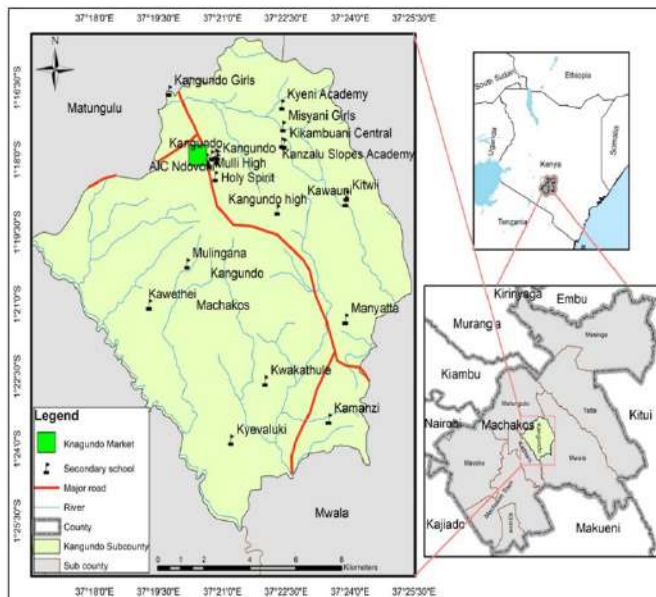
predominantly used by physics teachers. This hindered learners the opportunity to explore and come up with their findings on how physics works. It is believed that effective teaching methods boosts learners' performance. For this reason, the study sought to determine how computer simulations affected students' academic performance in physics at particular secondary schools in the Kangundo subcounty.

The study findings will effectively guide Ministry of Education (MOE) policy makers in advancing methods of teaching for different subjects. It will as well assist curriculum planners and developers in deciding on effective methods of teaching. Therefore, Kangundo sub-county and all Kenyan physics teachers will understand where to put more emphasis and how to maximumly use the computer simulation techniques in instructional process. This study will also help learners in their day-to-day life by relating what they learnt in school with what really exist in the real life.

Research methodology

Study Area

The study was conducted in Kangundo subcounty, one of the 8 subcounties in Machakos County. The subcounty is located in the eastern part of Kenya between latitude: $1^{\circ} 17' 52.51''$ S and longitude: $37^{\circ} 20' 49.38''$ E it is located 63km southeast of Nairobi. The subcounty has the following administrative wards: Kangundo North; Kangundo Central; Kangundo East and Kangundo West.



Study area map

Research Design

The study adopted nonequivalent group pre-test post-test quasi experimental design advanced by Reichardt (2019). Due to the existing of classes as intact groups, this design was used. Again,

secondary schools in Kenya currently are not using computer simulation techniques of teaching, this design allowed the researcher to introduce the use of computer simulated models in classroom and test its significance. The design was aimed at determining if the treatment applied to the experimental group impacted the study findings (Creswell & Creswell, 2017).

Table 3:1 Research design description

Group	Pretest	Treatment	Posttest
Control		C	
Experimental		X	

Key

X-computer simulation instructional method

C-Conventional method

Subjects in control and experimental group did the pretest and posttest.

The design was chosen because it allowed the comparison of the final posttest results between the 2 groups, giving an idea of the overall effects of the treatment. In the research, the experimental group received the treatment X. The second set of students received traditional instruction. Results from the post-test for both groups were compared.

Research methodology

This study employed mixed methods where by quantitative research endeavored to establish the relationship between the effects of computer simulation an independent variable on instructional process of physics as dependent variables among selected form 1 students. Qualitative research was employed to enable researcher record observations on learners' participation and that of time usage as per the lesson plans of the physics lesson in selected schools taught with computer and those without. The teaching was done by the regular physics teachers from the sample schools. The teaching and learning took place for three weeks. An opinion of the experimental group was gathered after the application of computer simulation using Student Questionnaire (SQ).

Target Population

The study targeted 1560 students in form one classes and 31 physics teachers in 31 Kangundo sub-county secondary schools. Form one physics teachers were targeted to offer teaching on the topic under study as well as involving learners in learning by conventional methods and or computer simulation. Physics teachers also provided information on learners' performance in physics and any other information on availability and use of computer in the physics subject. Form one physics students were chosen since the content under study is in form one physics syllabus. They were also the ones taught and did the tests.



Sampling Procedure

In respect to IEBC 2013 Kangundo subcounty is divided into 4 wards namely; Kangundo North; Kangundo Central; Kangundo East and Kangundo West. The researcher stratified kangundo subcounty into 4 wards and 2 wards were chosen randomly by writing the names of wards in 4 pieces of papers and folding them. They were put in a container, shaken and 2 picked randomly to represent the sample wards. According to chepkwony 2019, Kenya secondary school are grouped into 4 categories namely; national, extra county, county and private schools. Kangundo has extra county, county and private secondary schools. In the 3 categorization of schools, in each there are those with computer and those without computers. In each category of school, 1 with computer and 1 without computer were chosen randomly. All teachers teaching physics in the selected form 1 secondary schools were purposefully chosen as respondents.

Purposively, school was chosen on the basis of having computers and those without giving priority to only those with functioning computer labs. Likewise, only form one students in those schools offering physics and computer lesson were regarded. The schools offering the computer and physics subjects was then sampled randomly to come up with working sample schools.

Purposively, form one Physics teachers selected taught the topic Pressure and involved learners in learning by conventional methods and or computer simulation in their respective groups.

Sample size

Total number of students and teachers used in the research were determined using Mugenda and Mugenda (2003) who concluded that 10% to 30% respondents from the target population would make a suitable sample size for the study. 6 teachers out of 31 and 230 students out of 1560 students in the selected secondary schools in Kangundo subcounty formed the sample of the study.

Data Collection Instruments

Data collection instruments refer to the items or tools used by researcher to collect data (Canals, 2017). The study used the following research instruments; Standardized Physics Achievement Tests (SPAT), Teacher and Student questionnaire.

Validity and Reliability

The researcher used expert judgement to assess content validity of research findings. Apart from content validity, construct validity was also essential. The researcher conducted piloting which existed as a form of pretest that ensured construct validity of the study findings.

Reliability of the questionnaire and tests were determined through the use of test-retest technique. The researcher administered pre-test (before treatment) and post-test (after treatment) exams of equivalent form to learners with the help of the selected teachers in respective secondary schools. The scores were then correlated by the researcher using Cronbach's alpha test on the reliability command in SPSS. It was accepted since it yielded correlation coefficient (0.801) that is above 0.7 that is; (Madan & Kensinger, 2017).

Data Collection Procedures

By use of demonstration, the researcher inducted selected teachers in experimental schools on how to teach the topic of pressure using computer simulation for 2 days. Researcher then specified the topic on which the comparison was to be made and gave pretest to learners. The researcher then allowed teachers to teach under her supervision for 3 weeks so that the entire topic was covered. Lastly, the researcher gave learners the posttest with the help of the selected teachers, then issued the questionnaire and marked them on the fourth week.

Before the actual lesson, the researcher obtained lesson plans for schools to be taught with computers and those without. The researcher went to class when the lesson began and determined how the

lesson was covered alongside the allocated time and on how learners participated in the lesson. Using observational checklists, the researcher was able to rate time taken as well as the learners' participation in lessons taught using computer simulation and conventional methods of teaching.

Treatment procedure

A nonequivalent pre-test post-test quasi experimental design was adopted in the study where by 130 students in 3 selected schools taught with computer was the experimental group while 130 students in 3 selected school without computer formed the control group for the study. Researcher administered the pre-test to all students before the treatment then marked the tests and establishes the learners' prior knowledge before learning on topic of pressure.

Control group (A) was then taught normally by the existing established conventional method while experiment group (B) was taught the same content using computer simulation techniques for a period of 3 weeks. The researcher was observing and recording time taken for each stage as well as the learners' participation during the lesson. At the end of the topic, posttest was administered to the control and experiment group after which marking and comparing of results for the 2 groups was done by the researcher.

At the start of the study, the researcher empirically assessed differences in the two groups that is control and experiment groups. However, the researcher found that experimental group (B) performs better than the control group (A) on the posttest, she then ruled out initial differences since the groups were in fact similar on the pretest. Questionnaire was used to collect data from physics teachers after the administration of post-test.

Data Analysis Techniques

Both descriptive and inferential statistics were used to analyze quantitative data in this study. Preliminary quantitative data was analyzed by calculating the mean,

standard deviation and the percentages. The researcher applied t-test and chi-square goodness of fit for detailed quantitative data. Qualitative data was coded and analyzed thematically.

Demographic characteristics of the respondents

There were one hundred and ninety six (196) students issued with questionnaires. Out of the total, one hundred and three (103) were female constituting the majority (52.60%). The assessed students who had not been trained on how to use a computer were majority 119 (60.70%) while the rest had been trained. Majority of the student stated that they had been using computers for a period of less than one year (85.60%) while few had been using for a period of between 1 and 2 years (4.60%) as illustrated in Table 4.1.

Table 1: Demographic characteristics of the learners

Question	Attribute	Frequency	Percent [%]
What is your gender?	Male	93	47.40
	Female	103	52.60
	Total	196	100.00
Have you been trained on how to use a computer?	Yes	77	39.30
	No	119	60.70
	Total	196	100.00
How long have you been using a computer?	None	113	57.90
	<1 years	54	27.70
	1[2 years	9	4.60
	3[4 years	9	4.60
	>4 years	10	5.10
	Total	195	100.00

For the teachers, both male and female had equal proportions (50.00%). Majority (66.70%) of teachers were in the age group of 25-35 years while a lower proportion of them were in the age group of less than 25 years as illustrated in Table 4.2. All assessed teachers had Bachelor's degree as their highest education qualification with greater than five years of experience but less than ten years (83.30%). In terms of experience in teaching Physics subject, all the assessed had been in the teaching field for less than ten years (100.00%) with majority having been trained on how to integrate ICT in teaching 5 (83.30%) as illustrated in Table 4.2.

Table 2: Demographic characteristics of the teachers

Question	Attribute	Frequency	Percent (%)
What is your gender?	male	3	50.00
	female	3	50.00
	Total	6	100.00
To what age group do you belong?	<25 years	1	16.70
	25(35 years	4	66.70
	35(45 years	1	16.70
	Total	6	100.00
What is your highest professional qualification?	Bachelors' degree	6	100.00
How many years of experience do you have in teaching physics	>5 years	5	83.30
	< 1 year	1	16.70
	Total	6	100.00
Have you been trained on how to integrate ICT in teaching Physics	yes	5	83.30
	no	1	16.70
	Total	6	100.00

Effects of computer simulation on learners' academic performance in physics

After the test, learners did the questionnaire and answered part B which asked on learners' performance in physics. Their responses were coded and analyzed afterwards as follows.

Survey responses on the effects of computer simulation on learners' academic performance in physics

To establish the effects of simulation on learners' academic performance in physics in selected secondary schools in Kangundo Sub County, the respondents were asked to rate different statements. On the statement that there are enough computers for use in the school, majority of the learners agreed 45(23.10%) with the statement while few strongly disagreed with the statement with a significant difference ($\chi^2 = 2.8$, d.f.=4, $p = 0.5918$). Majority of the teachers 5(83.30%) similarly agreed with the same statement with a significant difference ($\chi^2 = 43.56$, d.f.=1, $p = 0.0000$) as illustrated in Table 4.3.

From the study, Computer in education have become so ubiquitous today that they are being used for everything from basic computing tasks like writing a word file to high-end weather forecasting and drug discovery and everything in between. Institutions have employed computers in education for a number of purposes for a while now. They are used by teachers to gather educational resources and activities as well as student data.



Students, on the other hand, used them as sources for learning which explain why students and teachers pointed out that there were enough computers for use by learners in Physics classes in their school. The findings are in line with those of Banik & Biswas (2017) that although using computers in the classroom for education is not new, its breadth and use have multiplied. Students nowadays have unparalleled access to electronic resources at both their classrooms and their homes.

For the statement that all students have equal chance of use of computers, majority of the learners disagreed 67(34.50%) while a low proportion of them were neutral on the statement with a significant difference ($\chi^2 = 14.7669$, d.f.=4, $p = 0.0052$). Teachers however strongly agreed with the same statement ($\chi^2 = 16.34$, d.f.=1, $p = 0.0003$). From the findings, using computer at schools brings significant role among students and teachers. This is evidenced by the fact that students are given an equal chance while in form one to be enrolled in computer classes in their schools. In addition, Kenya's education ministry proposed that information and communication technology (ICT) such as computers, laptops, tablets and cameras be used to help teach certain subjects and improve how students learn. The technology was intended to stimulate creativity, help children understand complex topics and give them tools to learn more independently.

Respondents were also asked whether the instructional method used in this

topic was enjoyable. Majority of learners strongly agreed with the statement 90(45.90%) while few disagreed with the statement ($\chi^2 = 51.1969$, d.f.=4, $p = 0.0000$). On the same statement majority of the teachers agreed 4(66.70%) with a significant difference ($\chi^2 = 11.56$, d.f.=1, $p = 0.0007$) as illustrated in Table 4.3.

Instructional method used ensured that the students are attentive and this resulted to students having a positive attitude towards Physics subject. The findings are consistent with those of Kattayat, Josey, and Asha (2016), who discovered a statistically significant association between computer simulation use and attitude toward physics classes. Banik & Biswas (2017) also discovered comparable outcomes when examining the impact of computer-assisted education on students' academic performance in general science. On the statement that the instructional method used has made this Physics topic easy, majority of the learners strongly agreed 93(47.70%) followed by those who agreed 47(24.10%) while few 7(3.60%) strongly disagreed with a significant difference ($\chi^2 = 60.10$, d.f.=4, $p = 0.0000$). For the teachers, majority agreed with the same statement ($\chi^2 = 49.9581$, d.f.=2, $p = 0.0000$). In this regard, the findings of Oymak & Bekiroghu (2017) are supported, who highlighted that when technology was incorporated into the lesson, the students improved as learners and had better attitudes. The results supported those of Mwamba, George, Moonga, and Pondo (2019), who found that physics simulations significantly improved students' attitudes and performance

regarding electromagnetism topic.

On the statement that the instructional method used made learners understand the concepts more better, majority of the learners strongly agreed with the statement 97(49.70%) with few strongly disagreeing 9(4.60%) with the statement with a significant difference ($\chi^2 = 68.15$, d.f.=4, $p = 0.0000$). Similarly, majority of the teachers agreed 4(66.70%) with the statement as illustrated in Table 4.3.

The findings are due to the fact that with the correct teaching strategies, teachers can make the classroom a fun and effective place for students to gain vital intellectual and social skills that will serve them for the rest of their lives. A teacher can accommodate students with a variety of interests, skills, and learning preferences by utilizing one of the various frameworks available.

To increase students' chances of success in the classroom, a teacher or other professional, find it helpful to learn about innovative instructional practices in the sector. Tarng et al. (2019) and Chen et al. (2019) indicated that due to physics' significant impact on technology programs at universities and other higher institutions of learning, demand for physics should be rising. Miheho (2020) acknowledge that low enrolment and poor performance in physics are due to a lack of inspiring and well-trained physics professors, inadequate laboratory equipment, and the concomitant insufficient exposure to practical training.



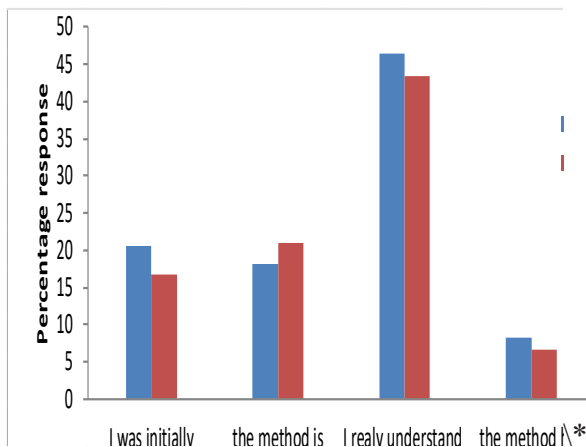
Table 4.3: Statement on the Effects of computer simulation on learners' academic performance in physics

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi square (χ^2)
There are enough computers for use in this school	Learners	30(15.40%)	45(23.10%)	42(21.50%)	45(23.10%)	33(16.90%)	$\chi^2 = 2$, d.f.=4, p= 0.5918
	Teachers	1(16.70%)	5(83.30%)	-	-	-	$\chi^2 = 43.56$, d.f.=1, p= 0.0000
All students have equal chance of use of computers	Learners	29(14.90%)	32(16.50%)	28(14.40%)	67(34.50%)	38(19.60%)	$\chi^2 = 14.7669$, d.f.=4, p= 0.0052
	Teachers	3(50.00%)	2(33.30%)	1(16.70%)	-	-	$\chi^2 = 16.34$, d.f.=1, p= 0.0003
The instructional method used in this topic was enjoyable	Learners	90(45.90%)	49(25.00%)	27(13.80%)	15(7.70%)	15(7.70%)	$\chi^2 = 51.1969$, d.f.=4, p= 0.0000
	Teachers	2(33.30%)	4(66.70%)	-	-	-	$\chi^2 = 11.56$, d.f.=1, p= 0.0007
The instructional method used has made this topic easy	Learners	93(47.70%)	47(24.10%)	30(15.40%)	18(9.20%)	7(3.60%)	$\chi^2 = 60.1$, d.f.=4, p= 0.0000
	Teachers	1(16.70%)	4(66.70%)	1(16.70%)	-	-	$\chi^2 = 49.9581$, d.f.=2, p= 0.0000
This instructional method used made me understand the concepts more better	learners	97(49.70%)	51(26.20%)	21(10.80%)	17(8.70%)	9(4.60%)	$\chi^2 = 68.15$, d.f.=4, p = 0.0000
	Teachers	2(33.30%)	4(66.70%)	-	-	-	$\chi^2 = 11.56$, d.f.=1, p= 0.0007

Learners also added that there were other ways that instructional method enhanced their performance in Physics which included understanding the topic better (44.90%), facilitating performance on the subject which was initially performed poorly (18.65%), the method was quite

interesting thus not boring (19.60%) with a significant difference ($\chi^2 = 45.80$, d.f.=4, p= 0.0000) from those who stated that the method has led to establishments of group discussions that enhanced students interactions in the subject matter (7.45%) and that the method had led to positive

attitude towards Physics subject (9.40%) as illustrated in Figure 4.1. There was no significant difference between responses of boys and girls in regard to any other ways instructional method enhanced learners' performance (p>0.05).



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Figure 4.1: Leaners responses on any other ways instructional method enhanced learners' performance.

For the teachers, majority added that the instructional method has led to students being more active and concentrate much on the subject (40.00%), with a significant difference ($\chi^2 = 12.00$, d.f.=3, $p = 0.0074$) from those who added that the method has Encouraged students / learners teamwork (16.70%), facilitating individual handling of practical and series of tests by students (16.7%) as well as that the method enables capturing attention and interests of learners (16.7%) as portrayed in Figure 4.2.

Figure 4.2: Teachers' responses on any other ways instructional method enhanced learners' performance.

The study showed that students who were taught with computer simulated models outperformed students who were not taught the same way (conventionally) and that using simulated models generally increased students' conceptual understanding and contributed to their academic success. Teachers who employ instructional tactics such as use of simulated model, enabled students to meaningfully link ideas acquired in the classroom to actual circumstances. They provide pupils with a chance to show off their understanding and make independent course corrections as necessary.

Students in experimental group engaged with simulated models in physics and could replay the demonstrations and learn more. In general, students adhere to the guidelines in using simulated models. These instructions frequently walked students step-by-step through the experiments in

topic pressure. Common learning objectives include thinking like experimental physicists and reinforcing the course material through real-world contact (demonstrations).

By separating lab exercises from the course topic, allowing students to make their own decisions, and questioning the notion of a "correct" experimental outcome, some recent initiatives have been made to move simulated (experiments) exercises in the direction of the latter objective. In contrast to the demonstration method, the laboratory methodology enables students to practice conducting experiments like actual scientists. However, in order for it to function effectively, a significant amount of time and money are frequently required.

Standardized Physics Achievement test (SPAT) pre and post test

Standardized Physics Achievement test (SPAT) pre-test was issued to the learners in different schools belonging to different categories included extra county, private and county secondary schools. There was pre- test control and pre-test experimental. For the pre-test control, extra county school mean mark was 9.33 ± 0.49 while the pre-test experimental was 9.16 ± 0.05 with no significant difference ($t = 3.1044$, $p = 0.0899$).

For the private secondary school, the pre-test of control mean mark was 6.99 ± 0.01 while the pre-test of experimental was 7.06 ± 0.05 with no significant difference between pre-test control and pre-test experimental ($t = -2.0604$, $p = 0.1755$).

For the County Secondary school, the mean mark for the control pre-test was 3.38 ± 0.15 while the experimental pre-test was 3.06 ± 0.08 with no significant difference between the two ($t = 2.6047$, $p = 0.1211$) as illustrated in Table 4.4.

Table 4.4: Pre-test for control and experimental Standardized Physics Achievement test (SPAT)

	Pre-test control mean mark (%)	Pre-test experimental mean mark (%)	t-test	p-value
Extra county	9.33±0.49	9.16±0.05	3.1044	0.0899
Private	6.99±0.01	7.06±0.05	-2.0604	0.1755
county	3.38±0.15	3.06±0.08	2.6047	0.1211

There was post-test control and post-test experimental. For post-test control, extra county school mean mark was 10.16 ± 3.05 while



post-test experimental was 13.80 ± 0.06 with a significance difference ($t = -15.1425$, $p = 0.0043$).

For the private secondary schools, the mean mark for control post-test was 8.36 ± 0.57 while the post-test experimental was 10.43 ± 0.19 with a significance difference between the two ($t = -43.6394$, $p = 0.0005$).

For the county secondary school, the mean mark for control post-test was 6.37 ± 0.38 while post-test experimental was 7.31 ± 0.38 with a significance difference between the two ($t = -22.1560$, $p = 0.0020$) as illustrated in Table 4.5.

Table 4.5: Post-test for control and experimental Standardized Physics Achievement test (SPAT)

	Post-test Control mean mark (%)	Post-test experimental mean mark (%)	t-test	p-value
Extra county	10.16 ± 3.05	13.80 ± 0.06	-15.1425	0.0043
private	8.36 ± 0.57	10.43 ± 0.19	-43.6394	0.0005
county	6.37 ± 0.38	7.31 ± 0.38	-22.1560	0.0020

According to findings, computer simulation increases the performance in physics. The finding are in line with Guy and Lownes (2015) who found a substantial difference in student performance between students taught using a hybrid format of computer simulation and those taught using the conventional method in the USA; the study came to the conclusion that those taught using computer simulations are more successful than the latter.

The finding agrees with those of Teke, Dogan, and Duran (2015), in Turkey, that computer simulations resulted to favourable impact on the academic performance of the treatment group's 7th grade students. Findings also demonstrated that training delivered through simulation had favourable results to the learner's advantage. Riaz, Naureen, and Morote (2016) looked at the relationship between simulated class management and learners' academic success in physics. For one year, 82 physics instructors at a secondary school in New York, USA, used simulations from the 2016 research, Physics Education Technology (PhET), as a teaching strategy. The results did, in fact, show a connection between simulated class management and students' academic success in physics. The study also suggested using simulated class management to boost physics

students' academic performance.

The study findings also concur with those of Piraksa & Srisawasdi (2014), that simulation-based inquiry increased the understanding of physics by students about the refraction of light, in comparison with a dual-situated learning model. The post-test results showed that the treatment group did better than its counterparts in the control group.

To test the null hypothesis that there was no significant difference between learners' academic performance in physics between groups taught using computer simulation and group taught using conventional method, the research findings established the presence of a significance difference in performance with those taught using computer simulation performing better. This concluded that the null hypothesis was rejected.

Conclusion

From the results of this study, first, it can be concluded that computer simulation method was the suitable method in enhancing learners' academic performance in physics than conventional method of teaching. Computer simulation method of teaching therefore, has the ability to improve the students' retention of pressure concepts in Physics. It was further suggested that, this study should be repeated in other sub-counties in the country to ascertain consistence in the effectiveness of computer simulation method of teaching on learners' academic performance.

Recommendation

Computer simulation method should be adopted by all the physics teachers in teaching physics concepts in order to improve students' performance. This was evidenced by experimental group students' improvement in SPAT in post-test when this method of teaching was used.



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