Computer Tutorials and Drill-Practice Strategies on Senior Science Students' Academic Achievement on Energy Transformation in Nature, Uyo, Nigeria

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Abstract

The study used computer tutorial and drill- practice strategies to investigate students' achievement on energy transformation in nature, Uyo, Nigeria. The study was guided by three research questions and three hypotheses. Quasi-experimental design of non-randomized pretest, posttest control group was used for the study. Population was all 2,629 senior secondary two students and sample size was 210 science students selected from three secondary schools in their intact classes using purposive sampling technique. The instrument for data collection was Achievement Test. Three lecturers of test, measurement and evaluation in Science Education did instrument validation. Reliability index was .85 obtained using Kuder-Richardson Formulae-21. Data analysis for research questions used mean and standard deviation and ANCOVA for hypotheses formulated at.05 significant level. Findings revealed that students taught computer tutorial achieved and retained higher than those taught with computer drill-practice and lecture methods. Gender is a non-significant factor in academic achievement of students. The findings concluded that, computer tutorial enhances students' academic achievement in energy transformation in nature. The study recommends that teachers of science embrace computer tutorial and drill-practice strategies in teaching science concepts.

Keywords: computer tutorials, drill-practice, energy transformation, students' interaction, engagement

1. Introduction

Today's world has transformed to understand the need for science and technological advancement. This transformation is affecting the way teaching is done to meet evolving societal needs. Science and technology involve processes, principles, procedures and technological applications that aids this transformation. The use of science and technology is relevant to all spheres of life for advancing and applying new technology devices that move knowledge forward. These devices are catalyst changing the face of education. They enable learners to initiate knowledge search that provide information services to direct instructions, equip students' skills and capacities for competence, creativity and talent-driven potentials to harness. The 21st century skills require the use of digital devices with daily improvements and advancement. In the classroom students encounter these devices as laptops, smartphones, tablets, iPads and iPods. These devices help students complete assigned tasks on time. These tasks are easily done and comes through live images and tutorials. These devices inspire and encourage teachers and learners alike to build self-confidence and access learning in diverse ways to support multi-disciplines. Learners must gain knowledge and skills to adapt to changing needs of the emerging times.

Effective and modern teaching strategies employed by a teacher is a major contributory factor that influences a learner's understanding of an introduced concept. Teachers make decisions that affect classroom improvement and students' achievement. One of the ways is by employing appropriate teaching strategies to facilitate learning. A teaching strategy therefore, is the way a lesson is approached that will be used to achieve a set of given objectives. Teaching strategy is a major determinant of students' achievement in science and in the implementation process of instructional delivery. If proper choice of strategy is made and the plan well executed, students will actively engage in the lesson and derive benefit immensely (Aniodoh and Egbo, 2013). Science activities are to be well planned and implemented to enhance critical thinking, motivate interest, develop creativity and improve problem-solving and analytical skills among students. This gives relevance, value and meaning to learning.

The National Policy on Education in Nigeria (FRN, 2014) emphasize that science evoke students' curiosity in scientific concepts and processes, which lead to fundamental and applied researches in science at all levels of education. The main aims of teaching science in the secondary school is to produce scientifically literate adults that understand and make informed decisions to engage with science and technology. Students should be able to explore ideas, make investigative analysis and get knowledge with high critical ability to analyze information; acquire appropriate skills and competence for inquiry and develop skills for learning and research. Teaching science, is indeed a complex process and requires focus to achieve meaningful lesson outcomes (Etiubon, 2018). It is needful therefore, to stimulate interest among students of science to improve academic achievement using innovative teaching strategies to aid instruction. These strategies are technologically-induced to bring changes in style of teaching and to inculcate in the students' adequate mastery of knowledge to function beyond the classroom. The educational materials, school facilities and chalkboard are inadequate to manage skill types and competencies required of science teachers and students in Nigeria. They are to pave way from traditional teaching methods to more evolving and friendly strategies such as computer-assisted instruction with tutorial as well as drill practice inclusion. For better performance, there is need to improve upon teaching strategies employed for learners to

understand concept. It is important to choose appropriate teaching strategies such as computer-assisted instructive designs to achieve excellence in teaching science concepts.

Computer-assisted instruction utilizes computer and software application to simplify concept teaching, learners' skills and improve instructions. It is an interactive strategy that presents instruction to encourage, motivate and transform abstract ideas to reality for learners' easy grasp of concepts. The strategy facilitates understanding and comprehension of subject matter and facts, addresses the needs of users and make learners learn at their own pace (Ibrahim, 2012). The learning process is enriched with the use of graphics, texts, videos and sound. Topics are presented and the understanding of students are tested with computer-assisted programs that involve the use of drill practices, tutorials, problem-solving and instructional games and simulations. These instructional strategies can be used to tutor and facilitate students' skills and competence to perform better at a task.

A tutorial is a computer program that engages and assist users in learning. It is a strategy that provide information to students in the way and manner human tutor does. Tutorial can be learnt independent of time and place. Users are enabled to learn on demand and when motivated. Sessions could be skipped if learners are not beginners.

Computer tutorials is one of the approaches of computer-assisted programmes. It is the use of computer for learning that allows the interaction of learners with the computer in a manner that ensures thorough learning and mastery of a specific concept compared to traditional teaching. Preferences of computer tutorials are growing rapidly and providing teachers better options to collaborate with their students. There is growing interest and awareness among learners using online educational tutorials and software to study in variety of ways. Students are able to structure and pace their patterns of learning, identify skills and resources to achieve learning objectives. Ampuch, Hiranrat, Pimbaotham and Singnam (2014), opine that the use of computer helps to increase students' motivation as it plays significant roles of providing feedback such as 'correct', 'incorrect', 'ok', 'no', 'try again' to learners. The feedbacks enable students correct faulty impressions of inappropriate knowledge already acquired. This tutorial strategy attempts to shift students from the traditional lecture form of instruction to a more innovative method of learning.

The most important value of computer tutorial is that it increases students' retention, and comprehension of the courses. Computer tutorial is a self-paced, self-contained, and structured-content instructional unit that uses hyperlink for videos and allows students to learn content without any teaching material except the computer (Udo and Etiubon, 2011; Shamsideen, 2015). The instructional program presents relevant information on concepts sequentially. It could be retrieved and studied for tests or any examinations. This tutorial approach is used to teach concepts designed to allow learners learn at their own pace and ability. Gambari and Yusuf (2015) posit that in computer tutorial, linear form or branching activities are used to present instructional tasks. In the linear form, students are provided activities with the same instructional sequence of information, an animation, a conclusion, review of the work; the computer asks questions and provide feedback. Since it is self-paced, it allows students to review materials if needed without slowing down the rest of the class. Learners engage the use of complex branching tutorial with alternatives depending on the mastery level of the learners (Saminathan, 2012). More materials are covered with flexibility using branching tutorial. Any branch can be selected and studied at any given time. The

computer can review previously learned facts or select advanced work to engage with (Igweh, 2012).

Computer tutorials, an important strategy that can enhance students' achievement has simulation packages that provide animation tools for experiments that lessens production cost. Technology does the teaching more efficiently and faster in a form of lecture controlled-system of what is presented to the learners. Students can better understand abstract concepts and become more active learners (Nadelson, Scagges, Sheffield and McDougal, 2015) when exposed to computer tutorial instruction. Udegbe (2010) observes that students achieved significantly higher using computer instructional tutorial package in probability than those taught using expository. Iyekekekpolor (2013) study on computer tutorial and lecture strategy on students' achievement in science indicate that computer tutorial led to higher achievement among students than lecture strategy. Any science concept therefore, may be taught with this approach to enhance learners' performance. Computer drill-practice is another computer-assisted instruction used to facilitate learners' knowledge and understanding of science concept.

Computer drill-practice is a programmed instruction with series of structured problems and exercises with immediate provision of feedback to students' responses. It is a programmed instruction that presents practice items. This instructional package allows specific problem-solving by students and helps them obtain feedback on performance. The strategy involves the repetition of routine exercises, tasks and words to guarantee flawless performance. (Rathakrishnan, Raman and Haniffa 2018) note that drill-practice is necessary to facilitate the learning of new content and assess previously learned content. Teachers and students are in touch with learning tasks, engage in creative information sharing, announce upcoming events, share contents of homework, note-taking, remind themselves of to-do-list, capture feedbacks, scores and upload activities for further studies. Drill practice provide opportunities for the use of smart-friendly phones that enable teachers access instructional activities anywhere they want. It saves teacher's time in grading practice activities. Drill practice package come in categories of activity-based flashcard websites like Quizlet or Study Blue that enable learners create flashcards, practice their uses in sequence and also share to friends. Branching drills in the package allows students engage in more challenging and advanced levels of questions after answering correctly a specified number. Distinctively high numbers of incorrect answers prompt the software to push students to lower stages of difficulty.

Roblyer and Doering (2013) suggested a four step-by-step design to achieve proficient result of drill-practice to include:

- The computer screen presents questions and problems for students to attempt answers
- Students respond
- Feedback is given by the computer to students on correct and incorrect answers
- If the student is correct, the feedback will show, and the student will move to the next level of difficulty. If student's response is wrong, the computer will show the student the accurate answer as feedback.

Azizi Yahya and Chu Siew Pang (2010) in the identification of drill and practice emphasize repeat activity of the facts or the efficiency gained. The need for drill practice enables students attain a high level of skill mastery while ensuring their lasting value. Carrying out repeated exercises gives students added advantage to retain knowledge of what they have learnt (Mohan and Balan, 2005). This guides and alerts students for deep concentration as they carry out activities. Students use these ideas to help themselves make sense of science learning experiences. Computer drill-practice offer closer, interactive and personal

attention one may require for learning to take place. Engaging students with these devices encourage high level participation, flexibility and help them become more creative at what they like doing for course selection and actualizing better performance. This gives promising input into science learning. Lecture strategy was also used in this study.

Lecture approach is a teacher-centred strategy that involves only the teacher doing most of the teaching activities while the students are either passive listeners that are minimally involved in the lesson. This approach uses talking and story-telling methods of teaching and the instructional strategy is chalk-talk and write. This teaching strategy does not promote active and meaningful learning of science because it appeals to the senses of hearing only. Students involvement in the teaching strategy is just to listen and sometimes take notes during the lecture, combine the information and organize it. The teacher does not recognize learners' individual differences to promote independent learning. Lecture strategy may result to covering large amount of topics in single class period and make students to develop listening skills. It is a straight forward process of imparting knowledge by the teacher to learners quickly. Teachers usually have greater control over what is being taught because they provide information on the topic only without involving the students (Kelly, 2015). It excludes the use of equipment and laboratory. A situation arises, where science teachers employ lecture-chalk-talk instructional strategy in teaching cannot facilitate a robust learning outcome for the conceptualization of science knowledge and therefore, should be minimally used for instructions. Another aspect considered in the study is gender.

Gender is one of the factors that influence learners' achievement in sciences in senior secondary schools. Results have been inconsistent on gender in researches over the years. Ugwuanyi and Nworgu (2014) report that male students tend to show interest in numerically inclined subjects like the sciences than female students because they are intelligent, bold, tactful and aggressive and like problem-solving involving mathematics; while female students like reading and writing and do not get encouragement in science classes from the teachers, but get negative comments about the kind of work/courses female learners should undertake. Mberekpe (2013) posit that gender imbalance exist in computer use, access, utilization, career and attitude. On the other hand, Gee and Umar (2014) show that female students are more significantly motivated than their male counterparts when learning using computer drill and practice software. Agboh (2015) observes that gender plays no significant effect when using computer assisted instruction such as computer tutorial. Kang (2019) carried out research to understand the relationship between students' interest in science and perspectives for their future career and found that under the same conditions both genders perform equally well in science. John and Olatoye (2014) and Dama (2014) posit that academic achievement of science students either male or female is not based on gender. If male and female students are exposed to the same quality material and resources for classroom instruction, adequately engaged in a friendly-learning environment unbiased from stereo-types, they achieve equally.

Energy transformation in nature is a multidisciplinary concept that requires proper understanding by all students. It is the energy changing process from one form to another. This process always happens within the individual and the environment around us. All energy is sourced from the sun. Radiant or solar energy from the sun is transformed to chemical energy by plants. This occurs during the process of photosynthesis. Photosynthesis purifies the environment by adding oxygen to, otherwise the atmosphere will be saturated with carbon-dioxide released during respiration, decomposition and combustion

(Herrman-Abell and Deboer, 2011). When food is consumed, chemical energy in food is utilized by the body and transformed into mechanical energy by doing work. It is involved in simple activities like; the conversion of gas and oxygen which is chemical energy to mechanical energy within the engine of a car to enable movement.

Electrical energy is converted to heat in electric stoves, sound in loud speakers, light and heat in electric bulbs. Hydroelectric power stations generate electrical energy from mechanical energy harnessed by water flowing through a dam. Wind energy is harnessed through windmills and converted into mechanical energy. It is further transformed into electrical energy through turbine blade movements. Radiant energy from the sun is directly transformed to electrical energy in solar cells. Chemical energy which is stored in firewood is transformed to heat and light energy to keep a place warm and for cooking. The potential energy stored in a system is transformable to kinetic energy for movement. For instance, a roller coaster on a hilltop possesses potential energy that is gravitational which is gained when the coaster descends the hill. Gravitational force exerted transforms the potential energy into kinetic energy which in turn moves the roller coaster. There is transformation of potential energy into kinetic energy and then its static state during energy transformations. This explains the law of conservation of energy which states that energy can neither be created nor destroyed. Energy in the universe remains in the same total quantity. During energy transformation of any kind, energy loss results as heat. Herrman-Abell and Deboer (2011), Etiubon and Ugwu (2016) observe that when heat is emitted from the thermo-flask, computer, car engine, television, refrigerators, generators, and any type of machine in use, it is for a time duration. The concept is to be understood by every student. Appropriate deployment of teaching strategies is needed to facilitate students' knowledge of the concept.

1.1 Justification for the Study

This study was necessitated to enable students understand the need of a digital changing world that teachers and students are to be abreast with. Digital global competitiveness is influencing how students are exposed to learning particularly for awareness and constant application. The current health crisis is making a face-to-face learning via digital technology an ideal approach to bringing knowledge to students and improving online learning skills. The health crisis has led to loss of jobs, lack of educational services to students particularly those in the rural areas and these will have severe consequences on students' lifelong careers.

1.2 Statement of the Problem

Students have difficulty relating most natural phenomena even in local experiences they have gained. Learning outcomes and academic achievement of students in internal and public examinations has been low. Traditional approaches have not enabled learners to creatively engage knowledge for global competitiveness. In many Nigerian public secondary schools, students are out-of-touch with modern technology-driven equipment as some have not made contact with these devices talk less of employing its use. Learners find it difficult to transit from classroom to the real-world, and are not effectively equipped with current and friendly-learning strategies that are changing the ways learning is done because they have challenges handling emerging digital devices for instruction and so achieve low in internal and external examinations. These may depend on strategies employed for instruction. Effective teaching and appropriate

learning of concepts like energy transformation in nature require suitable instructional strategies due to the abstract nature of concept. The question now is; will the use of computer tutorial and drill practice strategies have any facilitative effect on academic achievement of science students in the concept of energy transformation in nature? This is the basis for undertaking this study.

1.3 Purpose of the Study

The study investigates effects of computer tutorial and drill-practice strategies and gender as a variable on students' academic achievement on energy transformation in nature. The specific objectives are to:

1. determine the academic achievement of students taught energy transformation in nature using computer tutorial, drill-practice and lecture strategies.
2. compare the academic achievement of male and female students taught energy transformation in nature using computer tutorial strategy.
3. compare the academic achievement of male and female students taught energy transformation in nature using drill-practice strategy.

1.4 Research Questions

The study was guided by three research questions

1. What differences exist among students in academic achievement taught energy transformation in nature using computer tutorial, drill-practice and lecture strategies?
2. What differences exist between the academic achievement of male and female students taught energy transformation in nature using computer tutorial strategy?
3. What differences exist between the academic achievement of male and female students taught energy transformation in nature using drill-practice strategy?

1.5 Research Hypotheses

1. No significant difference exists among students in academic achievement taught energy transformation in nature using computer tutorial, drill-practice and lecture strategies.
2. No significant difference exists between the academic achievement of male and female students taught energy transformation in nature using computer tutorial strategy.
3. No significant difference exists between the academic achievement of male and female students taught energy transformation in nature using drill-practice strategy.

2. Materials and Methods

Quasi-experimental design of non-randomized pretest-posttest control group was adopted, with students taught in their intact classes. The study was guided by three research questions and three hypotheses. All 2,629 science students in senior secondary two in 14 public schools in the 2018/2019 academic session made up the population. A sample size of 210 science students from three selected schools was used. Purposive sampling technique was utilized in this study. Pretest was administered to students to examine the comparability of the groups before commencement of treatment. This procedure provides feedback to the study by measuring the previous knowledge level of the learner and what knowledge the learner gained from the experience. Results of the pretest were used as covariates. The instrument for data collection was

Achievement Test on energy transformation in nature. The instrument administered comprised of 25-multiple choice test items with each of 4-options-1point score for each correct answer and zero score for an incorrect option. Consequently, 25 was the maximum score. Prepared instructional packages with computer were used for the experimental groups and without computer for the control group. Computer tutorial was used to teach Experimental Group 1 while Computer drill-practice was used for Experimental Group 2, one computer per student. Instructional materials for groups 1 and 2 were laptop, projector, software in storage device as lesson video and instructional guide. Students listen attentively and write main points in their notebooks. Lesson video is replayed for clarity where students experience difficulty. In group 2, the computer displays drill-practice programme for students' study and practice. Students review their work for clarity where they experience difficulty. The control was taught using lecture strategy. The duration for treatment was three weeks. As class activities were concluded, the instrument was reshuffled and administered as posttest to students in the three groups. Pretest, Post-test scripts from all the groups were collected for marking and computation analysis. Three lecturers of test, measurement and evaluation in Science Education did instrument validation. A reliability index of .85 was obtained using Kuder-Richardson Formulae-21. Analysis of collected data was with mean and standard deviation for research questions and ANCOVA for hypotheses formulated at .05 significant level.

3. Results

3.1 Research Question 1

What differences exist among students in academic achievement taught energy transformation in nature using computer tutorial, drill-practice and lecture strategies?

Table 1: Adjusted mean of students' posttest scores taught using computer tutorial, drill-practice and lecture strategies with pretest as covariate

Strategy	N	$\bar{X}$	SD
Computer tutorial	72	22.53	1.71
Drill-practice	68	21.35	1.88
Lecture	70	20.12	1.60

Data in Table 1 shows the adjusted mean of students taught using computer tutorial, drill practice and lecture strategies are 22.53, 21.35 and 20.12 respectively with standard deviations of 1.71, 1.88 and 1.60. This indicate that students taught using computer tutorial achieved the most, followed by drill-practice with lecture strategy as the least. Standard deviation scores of students taught using lecture strategy is closest to their mean scores when compared to computer tutorial and drill-practice strategies. The scores of students taught using computer tutorial is closer to their mean score when compared with drill-practice. It is inferred from the standard deviations that the mean score of students taught using computer tutorial may not be greater than those of the students taught drill-practice and lecture strategies.

3.2 Research Question 2: What difference exists between the academic achievement of male and female students taught energy transformation in nature using computer tutorial strategy?

Table 2: Adjusted mean of male and female students' posttest scores taught using computer tutorial with

pretest as covariate

Gender	N	$\bar{X}$	SD
Male	32	22.56	1.00
Female	40	22.95	2.13

Data in Table 2 show the adjusted mean of male and female students taught using computer tutorial is 22.56 and 22.95 respectively with standard deviations of 1.00 and 2.13. This indicates that female students achieved better than male students considering the mean. The scores of male students taught using computer tutorial is closer to their mean scores than those of their female counterparts. It is inferred from the standard deviations that the mean score of female students taught using computer tutorials may not be greater than those of their male counterparts.

3.3. Research Question 3

What difference exists between the academic achievement of male and female students taught energy transformation in nature using drill-practice strategy?

Table 3: Adjusted mean of male and female students' posttest scores taught using computer tutorial with pretest as covariate

Gender	N	$\bar{X}$	SD
Male	30	21.32	1.00
Female	38	21.20	2.13

Data in Table 3 show the adjusted mean of male and female students taught using drill-practice is 21.32 and 21.20 respectively with standard deviations of 1.00 and 2.13. This indicates that male students achieved better than their female counterparts considering the mean. The scores of male students taught using drill-practice is closer to their mean scores than those of their female counterparts. It is inferred from the standard deviations that the mean score of male students taught using drill-practice is greater than those of their female counterparts.

Analysis of Covariance (ANCOVA) was used in testing the hypotheses.

3.4 Hypotheses 1

No significant difference exists among students in academic achievement taught energy transformation in nature using computer tutorial, drill-practice and lecture strategies.

Table 4: Analysis of Covariance of students' posttest scores based on strategy using pretest scores as covariates

Source of variation	SS	Df	MS	F_{cal}	P-value$_{cal}$
Pretest	200.74	1	200.74	81.224	.000
Strategy	195.46	2	97.73	39.543	.000
Residual	509.12	206	2.47		
Total	905.31	209	4.33		

Data in Table 4 show that pretest is significant since the calculated P-value .000 is less than .05, indicating the groups were not comparable. The comparability of the groups is however, taken by analysis of

covariance that would regress the pretest and posttest scores. The table also shows that the alpha level .05 is more than the calculated P-value (.000) of strategy. The notion that the hypotheses is null is therefore not accepted. This indicates that significant difference exists in the academic achievement of students taught energy transformation in nature using computer tutorial, drill-practice and lecture strategies. A post-hoc pairwise comparison test as Least Significant Difference (LSD) was carried out to ascertain the direction of significance.

Table 5: LSD Comparison Test of Posttest Scores by Teaching Strategies using Pretest Scores as Covariates

(I) Strategy	(J) Strategy	Mean (I-J)	Difference Std. Error	Sig.
Computer tutorial	**Drill-Practice**	**1.18***	**.271**	**.000**
	Lecture	**2.41***	**.271**	**.000**
Drill-Practice	**Computer Tutorial**	**-1.18***	**.271**	**.000**
	Lecture	**1.23***	**.268**	**.000**
Lecture	**Computer Tutorial**	**-2.41***	**.271**	**.000**
	Drill-Practice	**-1.23***	**.268**	**.000**

* .05 level is significant for mean difference.

3.5 Hypothesis 2

No significant difference exists between the academic achievement of male and female students taught energy transformation in nature using computer tutorial strategy.

Table 6: Analysis of Covariance of male and female students' posttest scores taught using computer tutorials with pretest scores as covariates

Source of variation	SS	df	MS	Fcal	P-value$_{cal}$
Pretest	43.839	1	43.839	18.686	.000
Strategy	2.724	1	2.724	1.161	.285
Residual	161.881	69	2.346		
Total	208.444	71	2.936		

Data in Table 6 show pretest to be significant since the calculated P-$_{value}$ (.000) is less than the alpha .05 indicating the groups were not comparable. The comparability of the groups is however taken by analysis of covariance that would regress the pretest and posttest scores. The table also show that alpha level .05 is less than the calculated P-$_{values}$ .285 of gender. The hypothesis said to be null is therefore, retained. This indicates that significant difference does not exist in the academic achievement of male and female students taught energy transformation in nature using computer tutorial strategy.

3.6. Hypothesis 3

No significant difference exists between the academic achievement of male and female students taught energy transformation in nature using drill-practice strategy.

Table 7: Analysis of Covariance of male and female students' posttest scores taught using drill-practice with pretest scores as covariates

Source of variation	SS	df	MS	F_{cal}	P-value$_{cal}$
Pretest	22.801	1	22.801	6.934	.011
Strategy	.226	1	.226	.069	.794
Residual	213.723	65	3.288		
Total	236.750	67	3.534		

Data in table 7 show that pretest is significant as the alpha .05 is greater than the calculated P-value .011, indicating the groups were not comparable. The comparability of the group is however taken by analysis of covariance that would regress the pretest and posttest scores. The result also shows that alpha level .05 is less than calculated P-value .794 of gender. The null hypothesis is therefore retained. This indicates that significant difference does not exist in the academic achievement of male and female students taught energy transformation in nature using drill-practice strategy.

4. Discussion of Findings

Findings from the study on the difference in the academic achievement of students taught using computer tutorials, drill-practice and lecture strategies indicated a significant difference among the groups. Students taught using computer tutorials strategy achieved significantly better than those taught using drill-practice and lecture strategies. The study also found that students taught using drill-practice strategy had a significantly better academic achievement than those taught using lecture strategy. These findings could be attributed to the supportive nature of computer to foster group participation, engage students actively, connect them with real global contexts, and provide adequate feedback/interaction frequently. The facilitative achievement may also be from advantage of students' interaction that the computer provides with the learning environment which invariably may have led to meaningful learning outcomes. Important and relevant learning activities coupled with motivation students derived from using the computer, may have fostered their interest in their effort to executively control their cognitive processes. The study findings also attributed the active engagement of students and frequent interaction through the use of computer to foster student-centred classroom instruction. This enabled students' direct involvement to increase their academic abilities, reduce distraction and focus on their cognitive development and construction of knowledge. The findings agree with Udegbe (2010) that there was a significant main effect using computer-aided instructional tutorial package on students' achievement in concepts of probability than those taught using expository. Iyekekekpolor (2013) also collaborated that computer tutorial led to higher achievement than lecture strategy. There is rewarding experience using computer to gain and diversify knowledge.

The findings in the male and female students' academic achievement using computer tutorial strategy indicated no significant difference between gender. This may have been due to the use of computer-assisted

instructional tutorial mode, that may have abridged the gender inequality. The findings could also be as a result of the enthusiasm and zeal exhibited by both male and female students through interaction with computer tutorial strategies. The findings agree with Gambari and Yusuf (2015), that gender difference shows no significance between male and female students. Kang (2019) observed equal achievement in male and female students with respect to interests in science and career perspectives for the future; and that under the same conditions both genders perform equally well in science. Findings on male and female students taught energy transformation in nature using drill-practice indicate that significant difference does not exist between gender. This could be that, when male and female students are provided with equal opportunity with participatory instructional strategy such as drill-practice, it facilitates their academic achievement as they pay more attention to lessons. The result is both male and female students can achieve alike. The findings support John and Olatoye (2014) and Dama (2014) that male and female students do not differ significantly in academic achievement with respect to gender. This is also true for instruction on learning energy transformation in nature.

5. Recommendations

1. Students should be assisted and encouraged by teachers and parents to engage the use of computer for constant practice to reduce learning difficulties particularly, on concepts considered abstract and difficult.
2. Teachers should be constantly practicing the teaching of science concepts using the computer to update knowledge on changing technologies.
3. School administrators should pay more attention to professional development of science teachers on computer literacy programmes by providing computers to secondary schools with and equipping its facilities to ease teaching science concepts.

6. Conclusion

The study findings conclude that computer tutorials improved students' academic achievements on energy transformation in nature than computer drill-practice and lecture strategies. Computer drill-practice also improved students' academic achievements than lecture strategies. It also shows that academic achievement of students is not significantly determined by gender.

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