International Journal of Science and Advanced Innovative Research
ISSN: 2536-7315 (Print) 2536-7323 (Online)
Volume 3, Number 4, December 2018
http://www.casirmediapublishing.com

Impact of Computer-Aided Instruction and Laboratory Facilities on Interest in Physics among Senior Secondary School Students in Kaduna State, Nigeria

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ABSTRACT

Our current teaching strategies appear unproductive to enhance problem-solving skills among students' of physics. There is need to move from traditional approaches to more innovative information and communication technologies enriched approaches for meaningful learning. The low interest exhibited by students' towards physics have been a matter of concern for stakeholders in education industry, as such motivated the researcher to investigate the impact of Computer-Aided Instruction and Laboratory Facilities on interest in physics among senior secondary school students' in Kaduna State. Three null hypotheses guided the study. The study adopted Triangulation which include; Survey and Quasi-experimental Design. The population of this study covered all SSII physics students in public senior secondary schools of the twelve (12) Educational zones of Kaduna state with a population of 1520 students as at 2016/2017 academic session out of which 200 SSII physics students were sampled from three public senior secondary schools in three educational zones using random sampling techniques. Two validated instruments were developed by the researcher; Physics Performance Test (PPT) and Physics Interest Inventory Questionnaire (PIIQ). The Research null hypotheses were tested with inferential statistics using t-test and Analysis of Variance at 0.05 and 0.01 level of significance. Results of findings show that there is significant impact of Computer-Aided Instruction and Laboratory Facilities on physics students. Similarly, the findings of the research revealed a significant impact of Computer-Aided Instruction and Laboratory Facilities on interest of physics students. The study further revealed that there is no significant difference in the impact of Computer-Aided Instruction on interest between male and female physics students. It was concluded that students' interest can be influenced by influencing teaching strategies like Computer-Aided Instruction and Laboratory Facilities. The study recommended the need for state government to incorporate Computer-Aided Instruction and Laboratory Facilities into physics curriculum at secondary level.

Keywords: Computer-Aided Instruction, Laboratory Facilities and Interest in Physics

INTRODUCTION

Educational sector is faced with series of changes and reforms in Nigeria and other developing countries, Nigerian government place higher emphasis in achieving millennium development goals (MDGs) by 2020 through science and instruction. It is good to reflect on matters concerned with physics and the dissemination of physics knowledge and lessons. To ensure this, several strategies for teaching physics have been developed which correspond to the accommodation of students' needs and divers learning methods. These teaching methods range from Demonstration, project Group work, cooperative Learning , expository, Discussion, Field-Trip, Question-Technique, Simulation, Experimental Team, Teaching, Verbal Instruction, Lecture Method, problem solving (Akpan, 2001; Obeka, 2010 & Josiah 2012). But it appears our current teaching strategies are failing to enhance problem - solving skills and logical thinking among student of science. There is a need to move from traditional approaches to more innovative information and communication technologies enriched

approaches for meaningful learning. The fast-paced, diverse and technologically advanced world has posed challenges for both teachers and learners. The use of computer-aided teaching (CAT) is a means of instructional delivery usually used with the traditional method to teach (Rolf & Gray, 2011). It is a presentation consisting of words, sound and pictures that is designed for meaningful learning (Mayer, 2005a; 2005b; 2005c).

The use of Computer-Aided instruction is fast gaining prominence and becoming one of the most important elements defining the basic competency of the students. Despite the abstract nature of physics, its teaching is to bring about scientific thinking in students; a mindset that requires student to test out, through experimentation, through the use of Computer-Aided Instruction, whether CD-ROM, power point, among others. A number studies have been made on computer- Aided Instruction such as Instructional radio, television, Computer among others, and result shows that it is an effective media for importing knowledge to the learners.

Laboratory is essential to the teaching of sciences and the success of any science course is much dependent on the laboratory provision made for it. It could be described as a place where theoretical work is put into practice. Whereas practical in any experience involves students in activities such as observing, counting, measuring, experimenting, recording, observation and carrying out field work. Laboratory helps to provide a forum wherein the learner is given the exercise to subjects, his belief, ideas, statement and theoretical proposition.

Research Hypotheses

The following hypotheses were formulated for the study:

HO_1: There is no significant impact of Computer-Aided Instruction and Laboratory Facilities in physics among senior secondary school students.

HO_2: There is no significant impact of Computer-Aided Instruction and Laboratory Facilities on interest in physics among senior secondary school students.

HO_3: There is no significant difference in the impact of Computer-Aided Instruction on interest between male and female physics students' in senior secondary schools.

LITERATURE REVIEW

Instruction has entered the classroom and become part of the teaching and learning processes. However, teaching and learning physics as a science oriented course is known for its abstract nature. Sometime, the physics teachers do not have adequate knowledge, but have to fall on ideas which lead to instructions with what physics theory says or meant. Students are left on their own, even when they are to read on their own. They find the material to read, where it is available most of them are obsoletes materials. That is, some of these materials include text book, journals, research publications and newspapers. Where these materials are lacking, the students are forced to lose interest, motivation and passion. In some cases frustration sets in and students abandon the discipline or subject matter (Physics) for another which they can

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cope with. Ibe-Bassey, (2000) and Inyang-Abia, (2004) noted that media is a continuum between stimulus response learning and cognitive learning to make abstract idea to reality, and facilitate effective learning. This indicated that computer-aided instruction is capable of facilitating the collection, preparation, presentation, storage, retrieval, conveyance and dissemination of information. Udo(2012) observed that the application of Computer-Aided Instruction in the school subject is to make learner learn better and teacher to teach well. It is not a hindrance to teacher-student relationship. It rather ensures transactional instruction communication where the teacher manages the human materials, times and space to make sure that instructional event occur leading to desirable change in behavior of students. To maintain and arouse the interest of students in subjects involving laboratory work, the teacher should be effectively involved in order to transfer knowledge and facts to learners for a good performance in many examinations. There is growing evidence that teachers do not exhibits behaviors which are complementary to achieving the stated objectives. They includes methods of teaching practical work, inadequate of resources for teaching and learning practical works, quantity and quality of teacher.

Okoli(1995) opined that no course in science and mathematics can be considered as complete without including some practical work. The practical work either ought to be carried out by individual either in science laboratories or in classes. At school level, practical work is even more important because of the fact that we learn by doing. Scientific practices and application are thus rendered more meaningful. It is an established truth that an object handled impresses itself more firmly on the mind than the object merely seen from a distance or in an illustration. Thus practical work forms an important feature in any science and mathematics course (UNESCO, 2008). There has been continuous effort by scholars towards purposeful pattern of influence of sex on interest (Obeka, 2008). While some student shows no difference others shows some difference due to gender. Obeka (2008) revealed no significant difference in the interest ability of male and female students in environmental educational concepts of geography due to exposure to demonstration and inquiry teaching methods

Research Design

The research design for this study is Triangulation which include; survey and Quasi-experimental designs. In survey, the researcher is interested in determining students' interest in physics. In quasi-experimental design, the researcher makes use of both experimental and control groups seeking to determine the impact of Computer-Aided Instruction and Laboratory Facilities in physics and on interest of physics students. In quasi-experimental design both the experimental and control groups were pre-tested (O_1) before treatment. The treatment (X_1) is teaching using Computer-Aided Instruction for (Experimental Group1 EG1) and laboratory facilities for (Experimental Group 2, EGII). Control group (X_0).This is followed by post-test (O_2) to determine students interest in the content taught.

Population and Sample of the Study

The population of this study covered the 12 Educational Zones of Kaduna State. The population cut across gender and students of SSII with average age of 17 years. Available data from Kaduna State Ministry of Education revealed that there are 1,520 SSII Physics students which formed the population of the study. A total number of 200 SSII physics students' drawn from three public senior secondary schools in three educational zones formed the sample of this study. Simple random sampling technique begins with balloting in which all the schools were written on sheet of papers, folded and placed in a container.

Instruments

The instruments used to obtain data were tagged Physics Interest Inventory Questionnaire (PIIQ) and Physics Performance Test Questionnaire (PPTQ). Physics Interest Inventory Questionnaire (PIIQ) is a twenty (20) item interest inventory questionnaire developed to determine the interest of physics students using the Likert's 5-point rating scale. These are; strongly Agreed (S.A); Agreed (A); Undecided (U); Disagreed (D); strongly disagreed (S.D). Weight is assigned to each option from five to one.

Validity and Reliability of the Instrument

Content validity of the instrument in this study was attained through presenting it to experts in Measurement and Evaluation from Federal University of Agriculture Makurdi, and peers for discussions and comments. This helped to eliminate ambiguities in the items. In ensuring that the instrument used to measure the reliability of the instrument is reliable. The instruments were subjected to pilot testing to a group of twenty (20) students in one Secondary School within the population but outside the sample and administered once to a group of testee after which split half method was used and analyzed using spearman Brown formula. The reliability of the instruments was further ensured by the analyst in the department of Science Education of the Federal University of Agriculture Makurdi and it was found suitable for this study.

Data Analysis and Interpretation

Data collected were subjected to descriptive and inferential statistics using One-Way Analysis of Variance and T-test. One-Way Analysis of Variance was employed to determine the impact of Computer-Aided Instruction and Laboratory Facilities in physics and on interest among senior secondary school students. T-test was used to determine the difference in the impact of Computer-Aided Instruction on interest between male and female physics students.

Test of Hypotheses

Null Hypothesis 1 (H_{01}): There is no significant impact of Computer-Aided Instruction and Laboratory Facilities in physics among senior secondary school students'.

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Table 1: ANOVA for the Impact of Computer-Aided Instruction and Laboratory Facilities in Physics.

Sources of variation	Sum of squares	Degree of Freedom	Variance estimate	F-ratio	P	Remark
Between-Group	675.20	2	337.6			
Within-Group	272.90	197	48.0	7.03	0.01	significant
Total	**948.1**	**199**				

From the result in table 1, sum of squares between groups was found to be 675.20 and sum of squares within group was 272.9. An F-ratio of 7.03 was calculated and the value of F-tab was found to be 4.61(∞) at 0.01 level of significant. Therefore, since the given F-tab value of 4.61(∞) was less than the obtained F-ratio of 7.03, the null hypothesis was rejected and the alternative hypothesis that there is significant impact of Computer-Aided Instruction and Laboratory Facilities in Physics among Senior Secondary School Students was accepted.

Null Hypothesis 2 (H_{O_2}): There is no significant impact of Computer-Aided Instruction and Laboratory Facilities on Interest in physics among senior secondary school students. One-Way Analysis of variance (ANOVA) was used and the result was presented on table 2.

Table 2: ANOVA for the impact on interest of students in Experimental and Control Groups

Sources of variation	Sum of squares	Degree of Freedom	Variance estimate	F-ratio	P	Remark
Between-Group	476.6	2	238.30	8.32	0.05	Significant
Within-Group	183.6	197	28.63			
Total	**660.2**	**199**				

The result in table 2 shows the change of interest of students in experimental and control groups. From the result, sum of squares between groups was found to be 476.6 and sum of squares within group was 183.6. An F-ratio of 8.32 was calculated and the value of F-tab was found to be 3.00(∞) at 0.05 level of significance. Therefore, since the given F-tab value of 3.00(∞) was less than the value of F-ratio of 8.32, the null hypothesis was rejected and the alternative hypothesis that there is significant impact of Computer-Aided Instruction and Laboratory Facilities on Interest in physics among senior secondary school students was accepted.

Null Hypothesis 3 (H_{O_3}): There is no significant difference in the impact of Computer-Aided Instruction on interest between male and female physics students in Senior Secondary Schools. Two-tailed t-test was used and the result was presented on table 3.

Table 3: Two tailed t-test of difference in impact of Computer-Aided Instruction on male and female students' interest

Group	N	Mean	Variance estimate	Degree of freedom	t-cal	p	Remark

Male	30	31.22	4.50				
Female	38	30.59	4.20	66	1.98	0.01	No sign. Diff.

From the result presented in table 3, t-cal value observed was 1.98, while the value of t-cri was 2.68 at 0.01 level of significance. Since the value of t-cri of 4.96 was more than the value of t-cal of 2.68, we then accept the null hypothesis that there is no significant difference in the impact of Computer-Aided Instruction on interest between male and female Physics students in senior secondary schools.

DISCUSSION OF THE FINDINGS

Computer-Aided Instruction and Laboratory Facilities are not only found to have significant impact in the current study, it was also upheld by Udo (2010), that the application of Computer-Aided Instruction in school subjects is to make learners learn better and teachers to teach well. This implies that students take active role in learning process and much more attentive to programs where animations and narratives are used. Computer-Aided Instructions has the ability to capture attention of learners because it addresses a variety of learning styles. The findings of this current study is in line with the study carried out by Yara and Otieno (2010), where Laboratory Facilities have been observed as a potent factor to quantitative education. Laboratory work stimulates learners' interest as they are made to personally engage in useful scientific activities and experimentation, affords learners the basic skills and scientific method of problem solving. Knowledge obtain through laboratory promotes long term memory.

The current study also found out that there is a significant impact of Computer-Aided Instruction and Laboratory facilities on interest in physics. The findings of this current study is supported by Obeka (2009), who views interest as the course of certain actions which acts as drive that propel students to acts in a certain way. The findings is also corroborated by the work of Obeka (2010), which revealed that there is a significant impact in the interest of students in learning science subjects when the learning is done through Laboratory and also assisted by Computer instructed materials. The findings of the current study also revealed that there is no significant difference in the impact of Computer-Aided Instruction on interest between male and female Physics students in senior secondary schools. The findingis supported by previous study carried out by Obeka (2010) on gender and interest which revealed no significant difference in the interest ability of male and female students in environmental education concepts due to demonstration and inquiry methods. This implies that the use of innovative strategies such as Computer-Aided Instruction etc. in teaching and learning engender students interest. In view of the above, innovative teaching strategies with integrated resource materials enhance students' interest irrespective of gender.

CONCLUSION

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On the basis of the results of this research and the analysis of the findings, the researcher concludes that Computer-Aided Instruction and Laboratory Facilities have significant impact in physics. Means of communicating science to learners by teachers must be adequately pursued so as to achieve the desirable goal through an effective methodology for any concept such as the use of Computer-Aided Instruction and Laboratory Facilities. There is significant impact of Computer-Aided Instruction and Laboratory Facilities on Interest in physics among senior secondary school students. Since Computer-Aided Instruction and Laboratory Facilities can engender interest in learners, there is need to move from traditional approaches to more innovative information and communication technologies enriched approaches for meaningful learning. The fast-paced, diverse and technological advanced world has posed challenges to both teachers and learners. The use of Computer-Aided instruction is a means of instructional delivery usually used to solve problems in the 21st century. There is no significant difference in the impact of Computer-Aided Instruction on interest between male and female Physics students in senior secondary schools. Hence, schools should encourage the use of Computer-Aided Instruction since it is gender friendly. The use of Computer-Aided Instruction and Laboratory Facilities is a functional way of providing education to learners that will assist in imbibing in them the required capacity for the world to work with. Computer-Aided Instruction and Laboratory Facilities impact on both declarative and procedural knowledge. With the use of Computer-Aided Instruction and Laboratory Facilities, students can develop analytical and interpretative skills. The classroom can be transformed into learning community thereby making it possible for many more people to be part of learning process in an open dialogue. It is interesting to know that students' interest can be influenced by influencing teaching strategies like Computer-Aided Instruction and Laboratory Facilities.

RECOMMENDATIONS

Based on the findings of this study, the researcher recommended that;

1. The Federal and state Ministry of Education, Policy Makers, STAN, NAERDC, Researchers and Physics Teachers should ensure that Computer-Aided Instruction and Laboratory Facilities as a matter of urgency and necessity be appropriately incorporated into physics curriculum in all secondary schools to enhance effective learning among students'.
2. The Federal and state Ministry of Education, Policy Makers, STAN, NAERDC, Researchers and Physics Teachers should emphasize the use of Computer-Aided Instruction and Laboratory Facilities to engender interest in physics among senior secondary school students.
3. The Federal and state Ministry of Education, Policy Makers, STAN, NAERDC, Researchers and Physics Teachers should encourage the use of Laboratory Facilities irrespective of male or female students.

Contribution to Knowledge

The following are the contributions of this study to knowledge;

1. The study was able to establish that both the use of Computer-Aided Instruction and Laboratory Facilities are capable of enhancing the interest of students in physics.
2. The study was able to establish that the use of Computer-Aided Instruction is capable of engendering interest of students in physics regardless of male or female students.

REFERENCES

Akpan, O. (2006). Laboratoey Facilities for chemistry teaching. Unpublished Seminar Paper, University of Calabar, Nigeria.

Ibe-Bassey, G. S. (2000). *Principle and Practice of Instructional Communication.* Uyo: Dorand Publishers.

Inyang- Abia, M. E. (2004). Essentials of Educational instruction. Calabar: Wusen publishers Limited, Nigeria.

Josiah, M. M. (2012). School location versus academic performance in physics: Does computer – Aided instruction (CAI) has any effect? *Journal of educational and social research, 2, (8), 12 -18.*

Mayer, R. E (2005c). Introduction to multimedia learning. In R. Mayer (Ed.), Cambridge handbook of multimedia learning (pp. 1-16). New York, N.Y.: Cambridge University Press.

Mayer, R. E. (2005a). Cognitive theory of multimedia learning. In R. Mayer (Ed.), Cambridge handbook of multimedia learning (pp. 31-48). New York, N.Y: Cambridge University Press.

Mayer, R. E. (2005b). Principles of managing essencial processing multimedia learning. In R. Mayer (Ed), Cambridge handbook of multimedia learning (pp. 169-182).New York: Cambridge University Press.

Obeka, S. S. (2009). EPODEWALAD *and Power Simulation Games of Geographical and Environmenta*l Education. Zaria; Ahmadu Bello University Press Limited.

Obeka, S.S. (2010) Effect of Inquiry and Demonstration. Methods on students education concepts of Education. *Journal of studies in Science and Mathematics Education, 1, (1), 52-58.*

Okoli, A. (1995). Education: a year of disaster at all levels. *Vanguard, January* 4, 12- 13.

Rolfe, E. V., & Gray, D. (2011). Are multimedia resources effective in life science education? A meta – analysis. Bioscience education, 18(3). Retrieved from http://www.biodcience.heacademy.al.uk/journal/vol18/beej-18-3.pdf.

UESCO (2008).Challenges of Implementing free day secondary education in Kenya. Experiences from Computer-Aided Instruction Nairobi: UNESCO.

Yara, P.O.& Otieno, K. O. (2010). Teaching/Learning Resources and Academic Performance in Mathematics in Secondary Schools in Bondo District. Computer-Aided instruction of Kenya. *Asian SocialScience* (ASS), 6, (12), 12 – 21. www.ccsenet.org/ass