



## **Problems that Inhibit the Introduction of Virtual Physics Laboratory in Colleges of Education in South East Zone of Nigeria**

**Dennis Uchenna Ugwoke, Bethran Ekwundu Oguama, Margareth Ngozi Ede**  
Department of Physics Education, Enugu State College of Education (Technical), Enugu

**Corresponding Author:** Bethran Ekwundu Oguama, e-mail: [bestson57@yahoo.com](mailto:bestson57@yahoo.com)

### **Abstract**

The study aims at finding out problems that affect the introduction of virtual physics laboratory in colleges of education in South East Zone of Nigeria. This is a survey study. The study covers all the colleges of education in the south eastern states of Nigeria. The population of the study includes all the physics students and the lecturers in the public colleges of education in south east, Nigeria; the total number of students and lecturers is 567 which include 506 physics students and 61 lecturers. The sample technique used for the study is simple random sampling technique that was used to sample 158 respondents, the instrument used for data collection was a structured questionnaire based on the research questions which guided the study. The instrument used was validated by two Physics lecturers from Nwafor Orizu College of Education, Anambra State and Alvan Ikoku College of Education, Owerri, Imo State and an experts in Measurement and Evaluation Unit of Enugu State College of Education (Technical), Enugu. Split half method was used to determine the reliability of the instrument using Spearman Rank Order Correlation Formula to calculate the reliability index which gave a coefficient of 0.91. Frequency and mean score was used to determine the scaling statement in the questionnaire. The findings revealed that lack of experts, poor infrastructure, electricity and internet connectivity, finance and staff in-service training are the major problems inhibiting the introduction. The researchers recommended that government should provide adequate number of qualified lecturers, ICT staff and technicians, ICT facilities-hardware and softwares for maximum benefits by all concerned.

**Keywords:** Virtual, Physics, Laboratory, ICT-Facilities

### **Introduction**

Physics deals with matter and their interactions. It could be referred to as science of measurement and its applications has contributed greatly to the production of instruments and devices of tremendous benefits to the human race in all works of life (Adeyemo, 2010). Physics is a requisite for subsequent specialist studies in pure science disciplines. In realization of its numerous advantages, physics has been introduced in Nigeria colleges of education under the umbrella of school of science education with a sole aim of producing physics teachers that would achieve the following objectives

- Transmit basic physics literacy to senior secondary school students.
- Stimulate and enhance creativity in young learners of physics.
- To enable the students acquire essential skills and attitudes as a preparation for the technological application of physics as well as to acquire desired knowledge for further studies, (Federal Ministry of Education, and 1985).

Physics as one of the pure science subjects has remained one of the most difficult subject in the school curriculum (NRRDC) in Oluwasegun (2015). The aforementioned issue has manifested in low enrolment of physics students especially in higher institutions of learning, poor academic performance in both external and internal examinations, poor interest of students, and poor quality of physics graduates and lack of physics teachers in Nigerian secondary schools especially in Enugu state (Okoli in Ugwuanyi, 2016 and



Isreal, 2007). Therefore, there is need to change from teacher-centered methods of teaching (lecture method) to student-centered strategy which entails intensive use of the laboratory/experimental method of teaching. The later virtual Physics laboratory inclusive unlike the former (lecture method) will not only make learning meaningful to students but also concretize learning and eliminate all forms of forgetting and enhance remembering of subject matter in the learners. Especially this period that Nigerian students are heavily immersed in web technologies (blogs, twitter, facebook, 2go and other social network sites as well as virtual worlds) and internet play which have increasingly important role in their social and academic lives (Legom and Towner, 2009). In order to recapture their interest into meaningful ventures such as intensive studying of physics, there is need to introduce the use of virtual physics laboratory or to complement it. The lecturers also need to be equipped with the required skills on how to use the virtual physics laboratory to combat educational problem.

Carnevale (2010) was of the opinion that effective adoption of virtual physics laboratory can make up for the shortcoming of the conventional physics laboratory. But the question is what could hinder the effective adoption of virtual physics laboratory either to complement the conventional laboratory or to replace it entirely? It is on this note that the researcher decided to investigate the factors that affect the introduction of virtual physics laboratory in colleges of education in South East Zone of Nigeria. Specially, the researcher intends to;

1. Determine the requirements within the colleges that physics lecturers consider essential to provide stability and support for the introduction of virtual physics laboratory in colleges of education in South East Zone of Nigeria.
  2. Ascertain the barriers within the school that physics lecturers consider necessary to be addressed to ensure effective introduction of virtual physics laboratory package in colleges of education in South East Zone of Nigeria.
  3. Find out the extent to which location of the colleges hinder affective introduction of virtual physics laboratory in colleges of education in South East Zone of Nigeria.
  4. Determine Physics students' view on the use of virtual physics laboratory in leaning physics
- The researcher, to have the grip of the above, developed four research questions to guide the study.

They include the following;

1. What are the requirements within the colleges that could be considered vital by the physics lecturers to provide stability and support for the introduction of virtual physics laboratory in colleges of education in south east zone of Nigeria?
2. What are the challenges within the colleges that physics lecturers consider necessary to be addressed to ensure effective introduction of virtual physics laboratory in their colleges?
3. To what extent does college location disrupt the effective introduction of virtual physics laboratories in the colleges?
4. What are the measures to ensure effective introduction of virtual physics in the Colleges of Education in South East Zone of Nigeria?

## **Research Method**

The design of this study is survey. It deals with the people's opinion and gives room for deep and thorough understanding of a given social unit. It studies a limited number and makes inferences using the limited number to generalize which is obtainable in the population. It uses adequate instruments for data collection such as questionnaire, interview, observation, tests, (Iketaku; 2011). This study was carried out in all the federal and state owned colleges of education in south east geopolitical zone of Nigeria. The area was chosen for this study because major population of graduates from colleges of education is employed into the school system. Hence, any study that captures teachers' education in zone invariably will be beneficial to the states and to the country at large. South eastern states of Nigeria include Abia state, Anambra state, Ebonyi state, Enugu state and Imo state. The target population of the study consists of all the physics students and the lecturers in the public colleges of education in south east Nigeria. The population comprises of 506 physics students and 61 lecturers in the physics departments in 5 states colleges



of education in the south east zone of Nigeria as at the time the study was conducted. The source of the information was various colleges of records as at 2017/2018 academic session.

The sample size of this study was one hundred and twenty-seven (127) physics students and 31 physics lecturers totaling 158 respondents. The researcher used proportionate stratified random sampling. The elements of the sample consist of 25% of physics students and 50% of the Physics lecturers from each college of education. This was to ensure even representation of each college as suggested by Enyi (2017). The questionnaire was designed and developed by the researcher to obtain students' view as well as lecturer's view on factors that affect the introduction of virtual physics laboratory in their colleges. The questionnaire was validated by two physics lectures from Nwafor Orizu College of education Anambra state and Alvan Ikoku College of education Owerri Imo State. The measure of the reliability of the instrument was determined by split-half method exercise using 20 physics students and 10 physics lecturers from College of Education, Ankpa, Kogi State and College of Education, Warri, Delta State in North Central and South-South Geopolitical Zones of Nigeria respectively. This was done in order to avoid biases that may arise in using the population where the study was carried out. The reliability coefficient obtained using Spearmans rank order correlation formula was 0.91.

A total of one hundred and fifty eight (158) copies of the questionnaire were distributed personally to the respondents in their various colleges of education. 158 copies of the questionnaire were returned; hence the percentage of questionnaire returned was 100% approximately. Mean statistic was employed in analyzing the data. The mean score and standard deviation were computed and used to answer the research questions. Modified four point-likert scale was rated in the following ways; Strongly agree (SA) -4 points, Agree (A) -3 points, Disagree (D) - 2 points and Strongly disagree (SD) - 1 points. For the research questions, the decision is that any mean score between the range of 2.5 and 4.0 is regarded as agree while 0.0-2.4 is considered as disagree

## **Results**

This data collection for the study was analyzed and presented in this section based on the research questions that guided the study

**Research Question One:** What are the requirements within the colleges that could be considered vital to provide stability and support for the introduction of virtual physics laboratory in colleges of education in South East Zone of Nigeria?



**Table 1: Requirements within the colleges that could be considered vital to provide stability and support for the introduction of virtual physics laboratory in colleges of education in South East Zone of Nigeria**

S/N	Items	SA 4	A 3	D 2	SD 1	ΣFX	N	Mean $\bar{X}$	Decision
1.	Effective introduction of virtual physics laboratory in my college requires adequate number of physics lecturers	58	50	25	25	457	158	2.89	A
2.	Effective introduction of virtual physics laboratory in my school requires adequate ICT staff	56	52	20	30	450	158	2.84	A
3.	Introduction of virtual physics laboratory in college will be adversely affected by lack of Technicians	80	50	20	8	518	158	3.27	A
4.	Introduction of virtual physics laboratory in my college will be affected negatively by inadequate funding by government	100	50	8	-	566	158	3.58	A
5.	Physics lecturers as well as ICT staff in my college need appropriate orientation and in –service training on technological innovations of virtual physics laboratory for it to effectively introduce for teaching and learning.	102	30	20	6	544	158	3.44	A

Intable one above the respondents agreed in item 1-5 with the mean scores 2.89, 2.84, 3.27, 3.58 and 3.44 that effective introduction of virtual physics laboratory in the Colleges requires adequate number of physics lecturers, and ICT staff . Also adequate number of technicians, adequate funding by government is essential. Physics lecturers as well as ICT staff in the college need appropriate orientation and in –service training on technological innovations of virtual physics laboratory for it to be effectively introduced for teaching and learning.

**Research Question Two:** What are the challenges within the colleges that physics lecturers consider necessary to be addressed to ensure effective introduction of virtual physics laboratories in their colleges?



**Table 2: Challenges within the colleges that physics lecturers consider necessary to be addressed to ensure effective introduction of virtual physics laboratories in their colleges**

S/N	ITEMS	SA 4	A 3	D 2	SD 1	ΣFX	N	Mean $\bar{X}$	Decision
6.	Poor electricity power supply, poor internet connectivity in my college would affect the introduction of virtual physics laboratory in my college	80	50	20	8	518	158	3.32	A
7.	Problem of insufficient time allocated to learning physics practical will affect the effective introduction of virtual physics laboratory in my college	100	32	20	6	542	158	3.43	A
8.	Poor orientation and lack of awareness of college management on technological learning has to be tackled for them to approve and encourage the use of virtual physics laboratory in my college.	10	32	20	6	542	158	3.43	A
9.	Poor computer skills of lecturers in my college have to be tackled if they will embrace and use virtual physics laboratory in teaching the students.	90	50	8	10	536	158	3.39	A
10.	Insufficient funding of learning program by the college management has to be tackled for virtual physics laboratory to be effectively introduced in my college	102	31	19	6	545	158	3.44	A

In table two above the respondents agreed in item 6-10 with the mean score 3.32, 3.43, 3.43, 3.39 and 3.44 that Poor electricity power supply, poor internet connectivity in the colleges would affect the introduction of virtual physics laboratory in the college, Poor orientation and lack of awareness of college management staff on technological learning has to be tackled for them to approve and encourage the use of virtual physics laboratory in the colleges, Poor computer skills of lecturers in the colleges have to be tackled if they will embrace and use virtual physics laboratory in teaching the students. Insufficient funding of learning programme by the college managements has to be tackled for virtual physics laboratory to be effectively introduced in the colleges.

**Research Questions Three:** To what extent does college location disrupt the effective introduction of virtual physics laboratories in the colleges?



**Table 3: College location disrupt the effective introduction of virtual physics laboratories in the colleges**

S/N	ITEMS	SA 4	A 3	D 2	SD 1	$\Sigma FX$	N	Mean $\bar{X}$	Decision
11.	Colleges of education in urban centers have more access to internet connectivity than their rural counterparts hence, they can support the introduction of virtual physics laboratory more than rural college	6	19	31	102	245	158	1.55	D
12.	Colleges of education in urban location attract more students and lecturers which in turn influence the rate of government funding unlike the rural colleges.	10	8	49	91	253	158	1.60	D
13.	Rural colleges of education lack basic amenities and infrastructures which can affect the introduction of virtual physics laboratory adversely unlike urban ones.	8	20	50	80	272	158	1.72	D
14.	Colleges in urban location are prone to side attractions, hence they cannot support effective introduction of virtual physics laboratory	6	20	32	100	248	158	1.58	D

In table three above the respondents Disagree in item 11-14 with respective mean scores as 1.55, 1.60, 1.72, and 1.58 which show that Colleges of education in urban centers have more access to internet connectivity than their rural counterparts, hence they can support the introduction of virtual physics laboratory more than rural colleges, Rural colleges of education lack basic amenities and infrastructures which can affect the introduction of virtual physics laboratory adversely unlike urban ones, that Colleges in urban location are prone to side attractions, hence they cannot support effective introduction of virtual physics laboratory.

**Research Question Four:** what are the measures to ensure effective introduction of virtual physics laboratories in the Colleges of Education in South East Zone of Nigeria?



**Table 4: Measures to ensure effective introduction of Virtual Physics Laboratories in the Colleges of Education**

S/N	ITEMS	SA 4	A 3	D 2	SD 1	ΣFX	N	Mean X̄	Decision
15.	Physics department should be adequately equipped to meet the requirement for the taught of virtual physics.	80	50	20	8	465	158	2.96	A
16.	Virtual physics facilities should be provided in the colleges of education	56	52	20	30	450	158	2.84	A
17.	Taught of virtual physic should be done in accordance with the objective of curriculum planners of physics	80	50	20	8	518	158	3.27	A
18.	Conducive environment should be provided for the equipment that are needed for virtual physics	102	30	20	6	544	158	3.44	A

In table four above the respondent agreed in item 15-18 with respective means score 2.96, 2.84, 3.27 and 3.44 that Physics department should be adequately equipped to meet the requirements for using virtual physics laboratories, that Virtual physics laboratory facilities should be provided in the colleges of education, that teaching with virtual physics laboratories should be done in accordance with the objective of physics curriculum planners and finally that Conducive environment should be provided for the equipment that are needed for virtual physics laboratory engagements.

**Discussion**

In table one above the respondents agreed in item 1-5 with the mean scores 2.89, 2.84, 3.27, 3.58 and 3.44 that effective introduction of virtual physics laboratories in the colleges of education requires adequate number of physics lecturers and adequate number ICT staff, Introduction of virtual physics laboratory in colleges will be adversely affected by lack of technicians, and inadequate funding by government. Physics lecturers as well as ICT staff in the colleges need appropriate orientation and in – service training on technological innovations for virtual physics laboratory to be effectively introduced for teaching and learning. The findings are in line with the view of Lotachukwu (2000) who stated that there should be various school plants which must be in place in order for educational objective such as proper orientation of the staff on the use of ICT and the provision and maintenance of the ICT facilities to be achieved. Also the above are in line with the views of Ugwu (2008) and Isiaku (2012) who maintained that lack of experts, poor infrastructure, lack of electricity, internet connectivity and lack of resources are problems for proper implementation of any computer based teaching and learning programme.

In table two above the respondents agreed in item 6-10 with the mean scores 3.32, 3.43, 3.43, 3.39 and 3.44 that Poor electricity power supply, poor internet connectivity in the colleges would affect the introduction of virtual physics laboratory in the colleges, Poor orientation and lack of awareness of college management on technological learning has to be tackled for them to approve and encourage the use of virtual physics laboratory in the college., Poor computer skills of lecturers in my college have to be tackled if they will embrace and use virtual physics laboratory in teaching the students and insufficient funding of learning program by the college managements has to be tackled for virtual physics laboratory to be effectively introduced in the colleges. This is in line with the view of Fitzgerald (1999) who stated that lecturer of higher institution of learning must have the necessary knowledge of computer operation so that such knowledge would encourage them to venture towards its utilization in information communication and technology instructional materials .





In table three the respondents disagree in item 11-14 with respective means 1.55, 1.60, 1.72, and 1.58 that Colleges of education in urban centers have more access to internet connectivity than their rural counterparts hence, they can support the introduction of virtual physics laboratory more than rural college, Rural colleges of education lack basic amenities and infrastructures which can affect the introduction of virtual physics laboratory adversely unlike urban ones, that Colleges in urban location are prone to side attractions, hence they cannot support effective introduction of virtual physics laboratory. This is in line with the views of Maxwell (2012) who stated the proper consideration of environmental factors is very important in citing physics laboratory. It is assumed that before the school was situated in the community necessary inquiries and consultations must have been considered by government before the school would be situated in the community.

In table above the respondent agreed in item 15-18 with respective mean scores 2.96, 2.84, 3.27 and 3.44 that Physics department should be adequately equipped to meet the requirements of using virtual physics laboratories, that Virtual physics laboratory facilities should be provided in the colleges of education that the use of virtual physics must be in accordance with the objective of Physics curriculum planners and finally that a conducive environment should be provided for the equipment that are needed for virtual physics laboratories. The findings are in line with the views of Iloabanafor (2002) who stated that the government should provide adequate learning facilities and adequate funds for proper teaching and learning of any science and technology related courses.

### **Conclusion and Recommendations**

Education systems around the world face formidable challenges that are taxing conventional strategies. According to Daniel in Amauala (1999), fresh approaches are needed to address persistent problems of the past and provide students and teachers with an education appropriate to the needs of a modern and information-based global economy. According to Afe (2002), in many African countries however, a major impediment is the lack of qualified lecturers. It is beyond reasonable doubt that high quality lecturers as manifested in their classroom disposition are a sine qua non of high academic performances of the students. Moreover, quality lecturers and other personnel and proper funding complement learning facilities virtual physics laboratories inclusive and enhance academic achievement of the students and teachers. Besides the school environmental factors, home environment and good managerial abilities of school personnel officers also contribute significantly on student's performance in school. Issues of poor facilities and lack of virtual physics laboratory for the teaching and learning of physics in south east colleges of education are very glaring and need to be addressed.

Therefore, the following recommendations were made;

1. Periodic and effective in-service training should be given to lecturers through seminars, conferences and workshops so as to enhance their professional knowledge and skills.
2. Government and school administrators should ensure adequate provision and utilization of learning facilities virtual physics laboratories inclusive so as to make the learning environment more conducive for the students.
3. Colleges of education in Rural and Urban areas should be equipped to the highest standard to accommodate the use of virtual physics laboratories. Emerging industries, and establishments that are pollution enlisting should be away from Colleges in order to reduce pollutions.





## References

- Adeyemo, S. A. (2010). Teaching and Learning Physics in Nigeria Secondary Schools: The Curriculum Transformation, Issues, Problems and Prospects. Department of Science and Technology Education, University of Lagos. pp. 99-111.
- Afe, N (2002). Human development (16<sup>th</sup> Ed.) *New York Alfred Aknopt inc Publisher.*
- Bruner, N. (1990), Relationship of Students Achievement and Characteristics in two Selected School Facility Environment Settings. *Paper presented at the 64th annual International conference of the Council of Educational Facility Planners. Edmonton, Alberta, Canada. October 3-7 ED286278.*
- Carnevale .O. (2010). Students' Perceptions of the Teachers' Teaching of Literature Communicating and Understanding Through the Eyes of The Audience. *European Journal of social sciences, Vol. 7, No. 3. Pp. 17.-39.*
- Cegniz, J. C. (2010). Educational research basic issues and methodology (2<sup>nd</sup> Ed) *University Trust Publisher, Nsukka Enugu*
- Efe .F. (2011) Importance of Audio visual Instruction. *West African Journal of Education 20 (2), 3-5.*
- Falode, A. A., Bellow, A. S., Idris A. S. and Abdul A. J (2014); National Policy on Provision of laboratory facilities (Revised). *London: National Education Research and Development.*
- Federal Republic of Nigeria (2004), *National Policy on Education.*
- Fitzgerald H. N. (1999). *The Art of classroom inquiry Port Growth: Heinemann Book Publisher Ltd*
- Gabari. I, Idris. V, Falode. Q &Fagbeemi.D. Z,(2008). Effects of Cooperative Learning and Problem Solving Strategies on Junior Secondary School Students' Achievement in Social Studies. *Journal of Research in Education Psychology, Vol. 16, No. 3, pp. 691-708.*
- Hornby,F. R &Sally, A. S (2014). *Physics Teaching in Nigeria. Ilorin: Atoto Press.*
- Iloabanofor, I. B (2002). Teacher – The place of teaching aids in Nigerian Education *West African Journal of Education, Vol. 3 No 2.*
- Isiaku. L. N (2012). "An Investigation into the Relationship between Instructional Resources and Students' Academic Performance in Secondary Schools in Abeokuta Local Government Area of Ogun State of Nigeria". *An Unpublished M.Ed Thesis.*
- Isreal, I. A. (2007). Cases of Student Enrolment in Physics. *Journal of Empirical Research in Science and Technology Education (181).*
- Legom U. and Towner. E (2009), Management of Primary and Secondary *Education in Nigeria. NAEAP publication.*
- Lotachukwu, J.N (2000). Resources, utilization for effective teaching of science technology and Mathematics in the New Millennium 41<sup>st</sup> *Annual Conference Proceeding of Science Teachers Association of Nigeria 38 – 41*
- Maxwell P. L (2012). Technology use and teaching of Mathematics in the secondary schools. Retrieved on 24<sup>th</sup> February 2012 from [www.tiri.org.nz/pdfs/9225](http://www.tiri.org.nz/pdfs/9225)



- Obasi, M, K (2015). Gender issues in Pre-science teachers' training: ICT literacy and online learning. *Australian Journal of Educational Technology* (224) 1-20.
- Okoli. J. N. (2006). Effect of Investigative Approach and Expository Method on Science Process Skill Acquisition by Biology Students. *Journal of Science Teachers Association of Nigeria* 41 (1&2), 79-88.
- Oluwasegun A. I, (2015). Web.based teaching and learning: Two Series Examples. Proceeding of the 2004/RMA International Conference Olan Nigeria
- Ozden. M. J and Ozdener, E. P.(2010) Availability of Educational Resources of Pre-vocational Agricultural science in secondary schools in Anambra state. *Journal of Research in Learning and Teaching* 1(1), 31-36.
- Skinner. O. I (1904). Learning to Trust: Transforming Difficult Elementary Classrooms Through Developmental Discipline. San Francisco: Jossey-Bass.
- Ugwu. C (2008), School Plant Management practice in Nigeria: Trends Issues and Problems. In A.A. Olagboye, J.O. Fadipe (Eds). Management of Nigerian Education: *Project Monitoring and School Plant Maintenance, Ondo: NEPA*