

Integration of Emerging Technologies in Teaching and Learning of Physics in Colleges of Education in Enugu State for Sustainable Development Goals.

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ABSTRACT

In this study, the researchers investigated the Integration of Emerging Technologies in Teaching and Learning of Physics in Colleges of education in Enugu State. The study area comprised all the eight (8) accredited public and private Colleges of Education in Enugu state. Descriptive survey research design was adopted for this study. No sampling was involved due to the manageable size of the population (30 physics lecturers: 21 males and 9 females). Two research questions and two null hypotheses guided the study. The instrument for data collection was a structured questionnaire. The researchers administered the Instrument to Physics lecturers in the Colleges of Education, the responses were collected and Cronbach Alpha statistics was employed to compute the internal consistency estimate of the items. The reliability coefficient obtained was 0.96. Research questions were answered using mean and standard deviation. Analysis of Variance (ANOVA) was employed in testing the hypotheses at $p < 0.05$. The results of the study indicated that the clever boards and multimedia projectors are fairly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. It was also shown that gender had no significant influence on the lecturer's proficiency in utilizing ICT tools in teaching and learning of Physics in Colleges of Education in Enugu State. It was recommended that lecturers in the teacher education institutions in the state should make up their minds to embrace and harness the new learning ICT tools brought by the emerging technologies for improving teaching and learning outcomes.

Keywords: Emerging technologies, ICT, Integration, Physics, sustainable development.

INTRODUCTION

The sustainable development goals (SDGs) otherwise known as Project 2030 is a set of international development goals adopted by United Nations (UN) summit on September 2015. The United Nations summit was made up of 193 countries with Nigeria as one of its members. The UN summit positioned Science, Technology and Innovation (STI) as key means of implementing the SDGs. The sustainable development goals are blueprints which consist of 17 goals and 169 targets with the main objectives to eradicate poverty, realize a sustainable world, secure the planet and ensure that everyone experience peace and prosperity to the fullest by the year 2030. Sustainable

development goal 4 (SDG 4) is one of the 17 SDGs that aims at ensuring inclusive and equitable quality education that will promote lifelong learning opportunities for all by the year 2030. The role of education in ensuring sustainable development is not limited to developing country like Nigeria but a global issue. Education is seen as a force for attainment of the SDGs with science education inclusive. In view of this the makers of National policy on education stipulated as one of the goals of education the development of appropriate skills, mental, physical and social abilities and competencies to empower the individuals to live in and contribute positively to the



society Federation Republic of Nigeria (FRN 2013).

Globally, it is an acceptable fact that quality education promotes the development of every individual and offers him /her opportunities for capacity building and enabling environment to contribute ones' quota to the society to enhance national, economic and social growth of that nation (Anamezie and Nnadi 2017). As the 21st century era cannot be understood and governed and the main global challenges cannot be adequately handled without a basic knowledge of natural sciences, implies therefore, that any nation desiring to move forward scientifically and technologically should do so through functional science education. Science education is an integral field of study that comprises science disciplines of Physics, Chemistry, Biology, among other sciences together with the processes involved in teaching and learning of science.

The crucial role of Physics in the development of any nation including Nigeria cannot be over-emphasized. Its contributions to national and technological advancement are felt in so many ways. Researches in physics have led to many brilliant inventions and discoveries. Various equipment used in the field of health, agriculture, transportation industries among others are all products of physics. The knowledge of physics is needed in the construction of satellites, drones, missiles; Global positioning system (GPS). It is the knowledge of physics is applied in developing and manufacturing of the telecommunication devices such as phones, computers, our home electrical appliances. The knowledge and concept of physics is that applied in the sophisticated emerging technological materials such as transistors, laser and other robotic machines that aid efficiency in the world driven by novel

scientific exploration (Anamezie,2018; Onah,Anamezie and Nnadi 2022).

The teaching and learning of Physics in the teacher training institutes like Colleges of education is aimed at training qualified and competent Physics teachers who would in turn, contribute towards nation building by teaching physics to students at all educational levels. Therefore, it is imperative to monitor students' performances in the teacher training institutions to ensure that the right future teachers are produced.

The emphasis on the teaching profession as enshrined in the National Policy on teacher Education states among other goals is to produce highly motivated, conscientious and efficient classroom teachers for all levels of the educational system, provide teachers with adequate intellectual and professional background sufficient enough for their assignment and to make them adaptable to changing situations (FRN, 2013). The same Policy also clearly stipulated that teacher education shall be professionally trained and that teacher education programmes shall be structured to equip teachers for effective performance of their duties, Information Communication technology (ICT) shall be incorporated into all teachers training programmes (FRN 2013).

Colleges of education are institutions where teachers are given professional and intensive training and are certified teachers. Colleges of education are managed by a body called National Commission for Colleges of Education (NCCE) who provides and regulates the activities of College of Education. NCCE is responsible for designing and delivering their programs and offering all subset of programs which are offered by the Colleges of Education.

According to Ofuma and Archibong (2021), the teacher training institutes should

inculcate in the mind set of intending future teachers those values that teachers are key figures in the learning processes and should anticipate new developments and challenges and prepare prospective teachers for their future role. This is so as various technologies are emerging by the day, making the 21st century classroom more engaging, compelling and attractive, giving the modern teacher new roles, new methods and new engagements in and out of the classroom.

There are diverse forms of emerging technologies and these include: Big data, artificial intelligence (AI), virtual reality (VR), Augmented reality (AR), block chain or distributed ledger, robotics, 3-D printing, Internet of thing (IoT), Drones, self-driving cars, Educational technologies among others. In this study the researchers' main focus is on educational emerging technologies. Emerging technologies in this sense are tools, innovations, advancement utilized in diverse education setting which includes face to face, distance, hybrid forms of education to serve varied educational purposes such as instructional, social and organizational goals (Veltsianos, 2010). Emerging technologies have changed the way we see the world. With different kinds of unique technologies appearing on daily basis in many parts of the world and different sectors of industries are already experiencing huge changes and education sector is not an exception. The educational landscape is ever changing and being influenced by new pedagogical approaches and emerging technologies which aim to revolutionize the learning process, eliminate some elements of traditional education, make learning more effective, engaging, relevant and fun.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) whose main goal is promoting education included in its clarion call for quality

education that there is a need to use the potential of ICTs in order to achieve its objectives by 2030 (UNESCO,2015). Therefore integrating ICTs into higher education implies using them as tools which facilitate learning as well as the dissemination of knowledge, thus permitting reaching the goal of learning in a more significant and excellent way.

Broadly speaking, ICT includes all forms of educational technology in learning and teaching. E-learning comprises technology enhanced learning, internet based training web-based training, computer based interaction, computer based training, computer-assisted instruction or computer aided instruction, online education, virtual education, virtual learning environment and digital educational collaboration. ICT enhances education through curriculum development design and innovation, which will put in place appropriate human and material instructional resources for effective teaching and learning of physics education in colleges of education. Application of ICT tools in teaching and learning of physics education is enhanced by the following tools: internet, emails, e-library, platforms, video conference, disks, flash memories, multimedia projectors, interactive white boards (clever boards) and many more. Others are ICT software such as Word processing, Blogs, desktop publishing program, database program, spreadsheet, etc. (Eno, 2021). These new ICT resources play crucial roles in virtually all areas of modern information and instructional delivery.

In this study teaching resources refer to varieties of ICT resources used for teaching and learning physics education. Specifically, the ICT resources referred to in this paper are interactive white boards (clever boards) and multimedia projectors. The different types and components of multimedia projectors are Cathode Ray Tube (CRT)

projectors, Liquid Crystal Display (LCD) projectors, Digital Light Processing (DLP) projectors, Pico projectors, Light Emitting Diode (LED) projectors and 3-D projectors. In the same way clever boards have different types and components such as Resistive Technology boards, Electromagnetic white boards, Laser scanner, Ultrasound/ Infrared, IWB software, desktop/laptop. For physics lecturers to be able to apply ICT resources in the physics classrooms, they need to have indebt knowledge and the practical skills on ICT.

Despite the crucial role physics plays in National development, the learning outcome of physics education in Colleges of education is not satisfactory. There exists evidence of poor academic performance in this subject. In their research to find out the reasons for poor academic performance by students in colleges of education Olusola and Rotimi (2012) attributed the poor performance of physics students in colleges of education to non-availability and poor usability of physics resources by Physics lecturers in colleges of education.

Oladebinu, Amos and Oyediran (2018) who conducted a study to identify the factors responsible for poor academic performance in colleges of education in delta state asserted that lack of funding by government, poor remuneration of teachers, inadequate supply of teaching resources such as ICT resources and non- usability of the few available resources by the lecturers are responsible for poor academic performance in Colleges of education.

In another development, a study carried out by Oyediran and Omorare (2014) to investigate the Utilization status of ICT for advancing teaching profession in colleges of education in Ogun State implicated poor funding of schools by government, low access to ICT facilities and poor methods of

transmitting knowledge by lecturers as the factors responsible for poor academic performance in colleges of education.

Garba, Termit, Yusuf and Ziden (2013) also observed that despite the development in the capacities of ICT, the level of application of ICT resources in Nigerian Colleges of Education is not appreciable and its impact on teaching and learning is not yet felt and that lecturers in the Nigerian colleges of education are not yet prepared to embrace the challenges of surviving in the 21st century driven by emerging technologies.

Other researchers noted that the main barriers hindering the integration of ICT and hence resulting to poor learning outcome in the colleges of education include the lecturers' lack of confidence, skills, Inability to properly use the digital tools, lack of access to technological tools among others (Ekabua, Ogini & Ogwara 2019; Larchanko & Barynikova, 2021).

In other to improve learning of Physics in Colleges of Education, the present study centred on the use of interactive white boards (clever boards) and multimedia projectors as ICT resources. This is because these resources encourage student engagement, makes the learning process more enjoyable, accommodates different learning styles, make lesson revision more convenient and reduce classroom costs. Interactive white boards (clever boards) and multimedia projectors are among the new technological advancements that are widely used in the classroom nowadays to increase students' knowledge and motivation. They are ICT resources that have interactive projection display that projects the computers video output. These operate with the combination of the interactive whiteboard, a computer, a projector, and Smart Board software. The projection screen is available as a white board or as a display frame that fits over a plasma screen.

The board can either be mounted or portable. The device is touch screen that allows the operator to manipulate content with the touch of a finger. Interactive white boards (clever boards) and multimedia projectors were preferred over the others because they are very easy to use and lead to promotion of students' learning skills. The use of interactive white boards (clever boards) and multimedia projectors in the classroom can make a difference for students who find it difficult in understanding abstract subjects (Aliyu et al., 2021). The researchers therefore deem it fit to investigate the usability status of ICT resources in the colleges of education in Enugu state irrespective of gender.

Another area of debate and controversy for researchers in science education is the issue of gender and ICT proficiency among male and female lecturers in Colleges of education. Several studies have examined the use of ICT resources with respect to gender differences in proficiency. For instance the studies of Mumporeze & Prieler (2017) showed that females have limited access to ICT resources than their male counterparts and that males generally are more ICT compliant than their female counterparts. Other researchers like Unegbu, Ogugua, Nnadimele & Nse (2019) noted that male lecturers in the institutions of higher learning embrace the use of ICT resources more than their female counterparts. Other studies have shown a gender imbalance in ICT usage and skills development in favour of males. Examples are (Lee et al., 2019; Tam et al., 2020). Due to lack of consensus regarding the issue of gender and proficiency in the use of ICT tools, the researchers consider it appropriate to include gender among the variables in this study.

Purpose of the Study

The main purpose of the study was to investigate the integration of ICT tools for

effective teaching and learning of Physics Education in Colleges of Education in Enugu State. Specifically, the study seeks to determine the:

1. Integration of ICT tools through utilization status of clever board for teaching and learning Physics in public and private Colleges of Education in Enugu State.
2. Integration of ICT tools through utilization status of multimedia projectors for teaching and learning Physics in public and private Colleges of Education in Enugu State.

Research Questions

The following research questions guided the study.

1. What is the utilization status of clever board in teaching and learning Physics in public and private Colleges of Education in Enugu State?
2. What is the utilization status of multimedia projectors in teaching and learning Physics in public and private Colleges of Education in Enugu State?

Hypotheses

The following null hypotheses tested at 0.05 level of significance guided the study

- H0₁:** There is no significant difference between the mean scores of male and female lecturers' proficiency in utilizing clever boards in teaching and learning Physics in Colleges of Education in Enugu State.
- H0₂:** There is no significant difference between the mean scores of male and female lecturers' proficiency in utilizing multimedia projectors in teaching and learning Physics in Colleges of Education in Enugu State.

Methodology

Descriptive survey research design was adopted for this study. Specifically, the

researchers adopted census descriptive survey research design for this study. A census survey research design is one which data is collected from every member of the population studied (Idoko, 2011). The census survey research design is considered most appropriate for this study because it provides a complete view of all the population under study, as it concerns utilization of ICT resources for teaching and learning of Physics. The entire population constituted the sample size used for the study due to the fact that the population is small and manageable. Hence, there was no sampling involved in the study. The study area comprised all the Colleges of Education in Enugu state. The accredited public and private Colleges of education in Enugu state are: Enugu State College of Education Technical (ESCET), Federal College of Education Eha-Amufu, Our Savior Institute Of Science, Agriculture and Technology (OSISATECH), Enugu, Institute of Ecumenical Education Enugu, Federal Cooperative College, Oji River (FCCO), Peace land College of Education Enugu, Elizabeth College of education Nsukka, and African Thinkers Community of Inquiry College of Education Enugu(www.Samphina.com.ng), retrieved online on 10/11/2022

The population for the study was made up of 30 Physics lecturers that are currently serving in 8 Colleges of Education in Enugu State. Among whom 21 are male and 9 are female lecturers. Also 20 Physics lecturers are teaching in public Colleges of education and 10 are in Private Colleges of education. The source is based on the data obtained from Field survey (November, 2022).

The instrument for data collection was a structured questionnaire adopted from NCCE checklist. The researchers named the instrument "Utilization Status of ICT Resources for Physics Education Questionnaire" (USICTRPEQ) besides the

researchers' direct observations. Direct observations with the checklist were used by the researchers in determining the availability status of ICT resources for effective teaching and learning of physics in Colleges of Education in Enugu State (Though the researchers' interest was on the usability status). The researchers administered the Instrument (USICTRPEQ) to Physics lecturers in the Colleges of Education. The responses were collected and Cronbach Alpha statistics was employed to compute the internal consistency estimate of the items under the research questions on utilization status of the available ICT resources. This statistics was considered appropriate because it consists of four (4) rating scale. The reliability coefficient of 0.96 was obtained. Specifically, clusters 1 and 2 consists of 25 and 21 items per cluster respectively with four points rating scale response options of VHE- Very high extent, HE- High extent, LE- Low extent, VLE- Very low extent. Research questions were answered using mean and standard deviation responses with values of 4, 3, 2 and 1 for very high extent (VHE), high extent (HE), low extent (LE), very low extent (VLE) respectively was assigned Responses from which a mid-point mean value was calculated.

The decision rule was based on the values of the calculated mean of the response options numerical values. Therefore any item with a mean of 2.5 and above was regarded as high extent of utilization of the questionnaire items while any mean that was below 2.5 was regarded as low extent of utilization. Hypotheses were tested using Analysis of Variance (ANOVA). The choice of ANOVA was because more than two groups were involved. (That is government and private Colleges of Education). Also ANOVA takes into account the fact that the sub-group that makes up a population does interact and the interaction does have effect on the overall behaviour of the entire

population. The null hypothesis was rejected if the P-value is less than the alpha level ($P < 0.05$) and was not rejected if otherwise. The data was analyzed using SPSS version 20.

Results

Research Question 1: What is the utilization of clever board in teaching and learning Physics in public and private Colleges of Education in Enugu State?

Table 1: Mean and Standard deviation of Utilization status of clever board for teaching and learning of Physics in Colleges of Education in Enugu State

S/No	Items	Mean (\bar{x})	SD	Status
1	Resistive Technology boards	1.55	0.78	FU
2	Electromagnetic white boards	2.17	0.80	U
3	Electronic graphics board	1.21	0.49	FU
4	Magnetic cards for recording	2.48	0.99	U
5	Mobile communication gadgets such as iPad, itouch	2.03	0.33	U
6	Electronic readers	1.17	0.38	FU
7	Fax machine	1.21	0.41	FU
8	Mobile resources such as MP3, MP4, MP5 etc	2.55	0.63	U
9	Laser scanner	1.59	0.91	FU
10	Ultrasound /Infrared	1.52	0.83	FU
11	IWB Software	1.93	0.88	FU
12	Desktop Computers	2.76	0.83	U
13	UPS	1.69	0.76	FU
14	e- library containing Physics text books	2.10	0.62	U
15	CD-ROMs	2.14	0.74	U
16	Stylus Pen	2.72	1.10	U
17	Android Cell Phone	3.41	0.68	HU
18	Television set	2.41	0.63	U
19	Alternative Power Supply	2.41	0.91	U
20	Podcasts and streaming such as podcast, iLecture etc.	1.34	0.61	FU
21	Shared documents e.g. Slide Share, Google Docs etc.	2.28	0.92	U
22	Computer software such as MS excel, MS word etc.	2.41	0.68	U
23	Optical	1.21	0.56	FU
24	Flash memories	1.72	0.88	FU
25	Audio and video disc	1.62	0.82	FU
	GRAND MEAN	1.99	0.73	FU

Key: SD = Standard Deviation, HU = Highly Utilized, U = Utilized, FU = Fairly Utilized, NU = Not Utilized.

The data presented in Table 1 shows that items 1,3, 6, 7, 9, 10, 11, 13, 20, 23, 24 and

25 have means ranging from 1.0 – 1.9, indicating that the clever board of ICT

resource are fairly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. In the same vein, the means of items 2, 4, 5, 8, 12, 14, 15, 16, 18, 19, 21 and 22 have means ranging from 2.0 – 2.9, indicating that clever board of ICT resources are utilized for teaching and learning of Physics in Colleges of Education in Enugu State. Again, the item 17 has mean range of 3.0 – 4.0, indicating that clever board is highly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. Generally, the grand mean of the items is 1.99, indicating that clever

board is fairly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. Table 2 also shows that the Standard deviations (SD) of all the items are within the range of 0.33 to 1.10 and are positive which indicates that the respondents were not very far from one another in their responses.

Research Question 2: What is the extent of utilization of multimedia projectors in teaching and learning Physics in Colleges of Education in Enugu State?

Table 2: Mean and Standard deviation of Utilization status of multimedia projector for teaching and learning of Physics in Colleges of Education in Enugu State

S/N	Items	Mean (\bar{x})	SD	Status
26	Cathode Ray Tube (CRT) projectors	1.48	.57	FU
27	Liquid Crystal Display (LCD) projectors	1.45	.51	FU
28	Digital Light Processing (DLP) projectors	2.03	.82	U
29	Pico projector	1.14	.44	FU
30	Light Emitting Diode (LED) projectors	1.31	.47	FU
31	3 –D projectors	1.66	.77	FU
32	Overhead projector	1.90	.77	FU
33	USB Flash	2.21	1.08	U
34	Portable Video games	1.72	.59	FU
35	DVD	2.21	.62	U
36	Internet Connection Modem	2.69	.66	U
37	Laptops	2.66	.67	U
38	Audio System	2.24	.95	U
39	Digital cameras	2.31	.85	U
40	Transparencies	1.55	.78	FU
41	Wiki such as wikispaces, wikipad, Wikipedia	1.48	.78	FU
42	Digital Repositories e.g. Google scholar, YouTube,	2.31	1.04	U
43	Assessment and survey tools e.g. Exam & Quiz Builder	3.14	.52	HU
44	Asynchronous communications e.g. email, forums	2.45	.63	U

45	Synchronous communications e.g. Google talk, iChat	1.72	.84	FU
46	Satellite	2.00	.80	U
GRAND MEAN		1.98	0.72	FU

The data presented in Table 2 shows that items 26, 27, 29, 30, 31, 32, 34, 40, 41 and 45 have means ranging from 1.0 – 1.9, indicating that the multimedia projectors of ICT resource are fairly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. In the same vein, the means of items 28, 33, 35, 36, 37, 38, 39, 42, 44 and 46 have means ranging from 2.0 – 2.9, indicating that multimedia projectors of ICT resources are utilized for teaching and learning of Physics in Colleges of Education in Enugu State. Again, the item 43 has mean range of 3.0 – 4.0, indicating that multimedia projector of ICT is highly utilized for teaching and learning of Physics in Colleges of Education in

Enugu State. Generally, the grand mean of the items is 1.98, indicating that multimedia projectors are fairly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. Table 4 also shows that the Standard deviations (SD) of all the items are within the range of 0.44 to 1.08 and are positive which indicates that the respondents were not very far from one another in their responses.

Hypothesis 1: There is no significant difference between the mean of male and female lecturers proficiency in utilizing clever boards in teaching and learning Physics in Colleges of Education in Enugu State.

Table 3: Summary of Analysis of Variance (Oneway ANOVA) utilization of clever board by male and female lecturers for teaching and learning of physics in Public and Private Colleges of Education in Enugu State

Clever Board		Sum	of df	Mean	F	Sig.
		Squares		Square		
Utilization	Between	47.629	1	47.629	1.160	.291
	Within Groups	1108.923	27	41.071		
	Total	1156.552	28			
Gender	Between	.024	1	.024	.112	.741
	Within Groups	5.769	27	.214		
	Total	5.793	28			

Table 3 shows that at .05 level of significance, there was no significant difference on the utilization of clever board by male and female lecturers for teaching and learning of Physics in Public and

Private Colleges of Education in Enugu State, $F(1, 27) = .112, P(.741) > .05$. Therefore, the null hypothesis was not rejected. Thus, there is no significant difference between the mean of male and

female lecturer's proficiency in utilizing clever boards in teaching and learning of Physics in Colleges of Education in Enugu State.

Hypothesis 2: There is no significant difference between the mean of male and female lecturers proficiency in utilizing multimedia projectors in teaching and learning Physics in Colleges of Education in Enugu State.

Table 4: Summary of Analysis of Variance (Oneway ANOVA) utilization of multimedia projector by male and female lecturers for teaching and learning of physics in Public and Private Colleges of Education in Enugu State

Multimedia projector		Sum of Squares	Df	Mean Square	F	Sig.
Utilization of Multimedia projector	Between Groups	42.614	1	42.614	1.119	.299
	Within Groups	1027.938	27	38.072		
	Total	1070.552	28			
Gender	Between Groups	.024	1	.024	.112	.741
	Within Groups	5.769	27	.214		
	Total	5.793	28			

Table 4 shows that at .05 level of significance, there was no significant difference on the utilization of multimedia projector by male and female lecturers for teaching and learning of Physics in Public and Private Colleges of Education in Enugu State, $F(1, 27) = .112$, $P(.741) > .05$. Therefore, the null hypothesis was not rejected. Thus, there is no significant difference between the mean of male and female lecturer's proficiency in utilizing multimedia projector in teaching and learning of Physics in Colleges of Education in Enugu State.

Discussion

The results of this work showed that the grand mean of the items is 1.99 and 1.98 for items under clever board and multimedia

projectors respectively, showing that these ICT resources are fairly utilized. Generally, the integration of Emerging technological tools in the teaching and learning processes especially clever boards and multimedia ICT resources is found to be very effective in eliminating some elements of traditional education, giving way to new way of learning that makes learning more effective, engaging, relevant, fun and increases Physics students' performance. These results are in tandem with the views of (Khalick et al. 2016; Onwubuya & Iyade 2018; Chetlal & Gupta 2020 & Aliyu et al. 2021) who in their different studies concluded that ICT integration not only improve teaching and learning outcome but contributes to the growth and development

of a country by building up human resources and provides employment.

On Utilization status of clever boards and multimedia projectors for teaching and learning Physics in Colleges of Education in Enugu State based on gender, the null hypotheses tested at 0.05 level of significance revealed that there is no significant difference on the utilization based on gender. The researchers then concluded that gender has no significant influence on utilization of these ICT resources in teaching and learning of physics in Colleges of education in Enugu State. This study is in tandem with the work of Kpolovie & Awusaku (2016) who observed that gender is a non-significant factor on the usability of clever boards and multimedia projectors in teaching and learning of physics in higher institutions. However, the finding of this study is in disagreement with the views of Mumporeze & Prieler 2017, Lee et al., 2019 who noted in their respective studies that there is a significant difference in utilization of multimedia projectors and clever boards by lecturers in favour of male lecturers.

Conclusion and recommendation

The major findings among others showed that the clever boards and multimedia projectors are fairly utilized for teaching and learning of Physics in Colleges of Education in Enugu State. Also there is no significant difference between the mean scores of male and female lecturer's proficiency in utilizing clever boards and multimedia projectors in teaching and learning of Physics in Colleges of Education in Enugu State. It is generally concluded that the use of interactive white boards (clever boards) and multimedia projectors in the classroom can make a difference for students who find it difficult in understanding abstract subjects.

However, there are some challenges facing the integration, such as: poor ICT

infrastructure, lack of standard ICT policies, poor funding, poor Internet and network facilities, poor power supply and lack of professional development program, lack of interest of some teachers to embrace the emerging Technologies.

These challenges could be overcome if the following are given proper attention:

- If government emphasizes professional development, provide adequate funding to secure modern ICT facilities, provide constant power supply, organizes ICT workshops, seminars and conferences, put in place some measures in raising the confidence levels of lecturers and appropriate in-service and initial teacher training in ICT.
- This should include recognizing and rewarding the use of ICT in form of appraisal schemes and packages.
- Policy makers and curriculum planners of National Commissions for Colleges of Education (NCCE) should make adequate provision of ICT digital devices in teaching and learning processes for both pre-service and in-service training.
- ICT experts with credibility who have developed high quality skills on ICT capabilities should be invited for this training, seminars and workshops for human capital development
- The challenge of epileptic power supply should be taken care of by using solar energy as a substitute
- Most importantly, the lecturers in the teacher education institutions in the state need to make up their minds to change their role and class organization and invest their energies, to embrace and manage the new learning arrangements brought by the emerging technologies in order to harness the potentials that emerging technologies have for improving teaching and learning practices.

- All these would aim at bridging the digital divide to a great extent for improvement in teaching and learning in the educational arena, thus helping in the development of the country

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