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Information and Communication Technology (ICT) Support Systems for Teaching and Learning Physics in Selected Secondary Schools in Eleme Local Government Area

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Abstract The present work examined the application of information and communication technology (ICT) support systems for teaching and learning physics in selected secondary schools in Eleme local government area of Nigeria. It applied descriptive survey method, oral interview and observation techniques to study the level of available ICT infrastructure, the qualifications and skills of Physics teachers, experience of students, ability to use ICT facilities for teaching and learning, benefits of use of ICT in such education system and perceived hindrances to its applications. Selected six schools each were randomly studied from the public and private secondary group of schools whilst the student population of students was 120. Standard questionnaire was designed, tested and distributed to both staff and students of the chosen institutions. The data collated were analyzed using statistical frequency counts, percentage grading scores and t-test. The results confirmed that some information communication and technology facilities were available in some secondary schools in the study area. For example, Onne Secondary School, Onne (Public) and Ranjennys' High School, Ogale (private) have a good number ICT infrastructure but the drive for its application is lacking due to some serious hindrances. It was also observed that lack of skilled and computer literate teachers cum technical staff affected the uses of the available ICT resource facility. This created low interest and morale for the students thereby making applications of ICT difficult. Besides it was revealed that the average success of learners (students) in external public examinations where ICT-applied examinations are emphasized was about 51.5%. Thus the desires and interest in computerized examinations is rated as low as 38%. Additionally, most students interviewed stated that regular teachings with ICT resources were completely absent. Hence the students could not really derive modern benefits of ICT conducted examinations and learning.

Keywords Information and Communication Technology, Physics, Hindrances and benefits

1. Introduction

1.1. Background

The increasing new technologies in our daily lives have affected most of socio-economic activities. In Nigeria, the educational system and standards at almost all levels were comparable to others within the developed World between 1970 to early 1990. However the decline in standard became obvious from late 1990. This is partly because over the past decades information and communication technology (ICT) system had drastically changed the techniques for teaching and learning, beliefs, values, culture, religion and entire way of life [1]. The most relatively affected areas include education systems, commerce and industry, manufacturing process, and social system. It is obvious that in attempting to keep abreast with some of the new advances, acceptance and applications of these newly discovered technologies to teaching and learning has become imperative.

Philip [2] opined that organizational ability to learn and subsequent applications of learnt concepts could determine its survival, progress, development and proper ranking of institutions in the world-wide global competitive markets. This type of growth in part could be dependent upon ability to quick response to changes and adaptation to new-found technologies. Bandele [3] opined that ICT is a revolution that involves the use of computers, internet and other telecommunication technology in every aspect of human endevour. Ofodu [4] defined ICT as electronic or computerized devices assisted by human and interactive materials that can be used for a wide range of teaching and learning and for public or personal uses.

Attempts have been made to review previous work done in

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the area of applications of ICTs to teaching and learning in secondary schools [5-8]. ICT varied definitions were presented whilst the expected requirement and conditions for effective applications and beneficial teaching experiences expected were presented. This was aimed at demonstrating the implications of the uses of ICT for learning and teaching within the context of a well-developed but new secondary school curriculum [9-12].

1.2. Statement of the Problem

The clarion calls by all and sundry for speedy solutions to the "apparent fallen standard" of education in Nigeria and by extension developing Nations, has been of great concern to most educationist [13-14]. The phrase "apparent fallen standard" is used here to emphasize the fact that standards of measures never changes. Thus the concept of falling standard is an enigma. Consequently one will prefer addressing the relative differences between the precisions of educational standards among the developed Nations and the developing countries (e.g. Nigeria). This is rapidly on the increase. Studies have shown that in developed Nations such as United States of America, China and Britain, just to mention but a few, knowledge-driven ICT educational processes arising from technological revolutions and new innovations are being applied to teaching-learning and new Curriculum development for the 21st century [15-18].

The problem is that the "apparent fallen standard" of education in developing countries (Nigeria) is being challenged by the emerging new ICT technologies that are not being adopted and applied to the educational system. Besides this study will determine the extent of availability of ICT infrastructure, manpower, skills and their subscription to teaching, application and learning. Also attempt shall be made in identifying its benefits, challenges and limitations.

1.3. Purpose and Goal of the Proposed Study

The increasing dynamic impact of ICT on the socio-economic world system calls for the total review of our education sector. This will assist the Nigerian nation in meeting up the already existing higher educational standard kept by the developed Nations.

1.4. Objectives

- Assessment of ICT facilities in Institutions.
- Assessment of Skilled and qualified academic Staff.
- Assessment of Curriculum (Review) that allows for ICT application.
- Perceived benefits of ICT in teaching and learning in a school system.
- Identify challenges to application of ICT in institutions

1.5. Research Questions

I. To what extent are the basic ICT teaching and learning resources available in your secondary school?

II. To what extent are teachers' qualifications and skills influence instructors in the use of ICT resources in electronic teaching and learning compared to traditional system?

III. Do you think Learners appreciate and are more interested in ICT teaching methods than older generation methods?

IV. What are the effects of ICT resources on the performance of secondary school students?

V. To what extent is the difference between the levels of student-instructors in the use of electronic resources for ICT learning compared to in traditional learning system?

1.6. Research Hypotheses

- There is no significant relationship between availability of ICT resources in public and private schools as applied to delivering lectures, teaching and online assignments.
- There is no significant effect between the level of the qualifications and skills of instructors in the use of ICT resources in electronic learning-education compared with traditional courses system.
- There is no significant effect on applications of ICT resources to teaching and learning by the teachers in both public and private secondary schools in Eleme LGA.
- There is no significant relationship between the adequacy of communication mode of electronic resources and the level of student's appreciations and applications in both public and private schools.
- There is no significant relationship between the level of interest and encouragement in using ICT resources in reading and learning.

1.7. Significance of this Study

The significance of this study is hinged upon the fact that data-base established for ICT-status in selected secondary schools (both Public and Private schools) in Eleme local government can be applied in policy formulation processes for the progress of education in the state. This may involve development of infrastructure, technical skills and applications of modern electronic teaching and learning systems.

The Teachers and Education managers/administration will in turn use obtained results for improving their teaching method by adopting the ICT system. This will probably assist in bridging the observed gap in "apparent low standard" of education. It is based on the belief that falling standard of education is a function of lack of application of ICT and other new technologies to teaching and learning.

Lastly, it will assist in encouraging the students to appreciate and further develop interest in application of ICT to studies and other meaningful uses rather than spending excessive times in the internet social media.

1.8. Delimitation

The current study is only concerned with some selected private and all public secondary schools within the geographic entity, namely Eleme Local Government Area of Rivers State, Nigeria. It concentrates on the development of

ICT applications to teaching and learning within the given environmental space. All the four public schools in Eleme LGA were taken whilst seven selected private secondary schools were chosen out of fifteen in the LGA. The other eight schools left out were not at the senior secondary school level (SSS) where Physics offered.

2. Methodology

2.1. Design of Research

This work was designed with the principles of experimentation and survey verifications. Basically the design was a survey type that describes the state of ICT application within the framework of secondary school. The main purpose of the study was to look at the uses of ICTs for teaching and learning. Thus the outlook of the design concentrates in three key areas namely infrastructure, skilled or experiences of teachers in ICT, teacher's and the student's participations

Therefore, it is expected that these three areas will combine to produce useful output. The key infrastructures expected in such schools are listed and the expected requirements and environmental conditions were clearly stated. The choice of this type of design method was based upon behavioral response to changes with particular respect to the main taxonomy of categories of affective domain.

2.2. Study Area and Population

The selected study area is Eleme Local Government Region in Rivers State of Nigeria. Its map derived from satellite imaging is presented in Fig. 2.1

2.3. Sample Collation and Sampling Methods

The data and reliable information for the study were derived via the following techniques:

1. Observation of physical infrastructure meant for implementation of ICT programme in a typical secondary school.
2. Interactive oral interview with principals or management staff of the school with a view to verifying the actual state of ICT Facilities.
3. Administration of questionnaire to both the physics teacher and randomly selected 35 students of each school.

A self-designed questionnaire entitled "project questionnaire for ICT application in secondary schools" was used to collate data for the study. The questionnaire targeted availability of infrastructure, skilled teachers and adaptation of students to ICT. The questions in the instrument were prepared on four-point scale structure (will be converted to percentages). The researcher reviewed the draft of the questionnaire, gave it to fellow students in same study group for corrections and evaluation. The corrected copy was further corrected and validated by a research expert, my able supervisor in education. Lastly copies of the questionnaire that were administered by the researcher and his assistants were returned. These were subjected to data-conversion, computation and subsequent analysis.

2.4. Instrumentation

The following standard instruments were involved in the current work. They are:

Approved Questionnaire
Physical visits and observation
Interview Techniques

The questionnaire was developed from research questions whereas oral interviews concentrated on school management staff.

Figure 2.1. The map indicating Eleme

2.5. Validity and Reliability of Instruments

The validity and reliability of the instruments used for the study were achieved through rigorous subjective processes, observations and oral interviews.

2.6. Administration of Instrument

The questionnaire and oral interviews were administered and conducted by a research assistant and the researcher respectively in all the selected secondary schools. The personality, integrity and personal contacts of the researcher with the respondents enhanced, the degree of sincerity, good work and quick responses from the respondents. This is because the researcher explained that the project was purely academic and not for regulation of standard or accreditation of schools.

2.7. Data Analysis Technique

Standard statistical methods shall be employed in analyzing the data collated. The results collected from the respondents will be converted to percentages, compared, aggregated and presented in both tabular and graphical format with the aim of making the facts visible. Besides, data collected will be divided into the management or school's view and students' opinion. The school management view shall be sub-sectioned into provision of infrastructure, applications, derivable knowledge in teaching and learning, and challenges. On the other hand, the students' opinion shall consist of availability of infrastructure, derived knowledge and challenges.

In addition, frequencies of occurrence shall be established and applied for the analysis. A comparative analysis will be conducted on application of ICT in Public and Private schools in Eleme LGA. Consequently, the hypotheses formulated and proposed were tested. The statistical tool assisted in substantiating and indicated clearer relationship between the research variables.

3. Results

The relevant questions for the availability of ICT infrastructure were collated and quantified. The quantified percentage-responses are presented in Table 3.1 with the mean-values for both public and private schools indicated. The other parameters were also computed and presented in the relevant sections. The t-tests were all conducted at 95% confidence level for two-way test and at $p>0.05$. The various degrees of freedom are indicated at the relevant Tables.

Research Question 1:

To what extent are the basic ICT teaching and learning resources available in your secondary school?

Table 3.1. Quantified percentage response for the presence of ICT facilities

S/N	INSTITUTION	%RESPONSE
1.	Alode Secondary School	34
2.	Ascension High School	36
3.	Comprehensive High School A	47
4.	Onne Secondary School	60
5.	Aleto High School	36
6.	Ebabu College	30
	Mean for Public Schools	**40.5**
7.	Lion Comprehensive High School	47
8.	Obarijima International School	60
9.	The Living Proof Academy	47
10.	Penniele Academy International School	67
11.	Ranjenny's High School	73
12.	Victor International	60
	Mean for Private Schools	**59.0**

Research Question 2:

To what extent are teachers qualifications and skills influence instructors in using ICT resources for electronic teaching and learning compared to traditional system?

Table 3.2. Responses for qualified personnel and relevant technical expertise

S/N	INSTITUTION	%RESPONSE		
		STAFF	STUDENTS	MEAN
1.	Alode Secondary School	63	60	61.5
2.	Ascension High School	63	60	61.5
3.	Comprehensive High School A	63	60	61.5
4.	Onne Secondary School	69	64	66.5
5.	Aleto High School	56	50	53.0
6.	Ebabu College	61	50	55.5
	Mean for Public Schools	**62.5**	**57.3**	**59.9**
7.	Lion Comprehensive High School	88	68	78
8.	Obarijima International School	69	50	59.5
9.	The Living Proof Academy	63	58	60.5
10.	Penniele Academy International School	69	65	67
11.	Ranjenny's High School	63	52	57.5
12.	Victor International	69	60	64.5
	Mean for Private Schools	**70.2**	**58.8**	**64.5**

Research Question 3:

Do you think Learners appreciate and are more interested in ICT teaching methods than older generation methods?

Table 3.3. Percentage of ICT appreciations to teaching and learning by Teachers

S/N	INSTITUTION	%RESPONSE		
		STAFF	STUDENTS	MEAN
1.	Alode Secondary School	70	50	60.0
2.	Ascension High School	74	50	62.0
3.	Comprehensive High School A	74	56	65.0
4.	Onne Secondary School	88	60	74.0
5.	Aleto High School	70	40	55.0
6.	Ebabu College	68	60	64.0
	Mean for Public Schools	**64.0**	**52.7**	**63.3**
7.	Lion Comprehensive High School	88	65	76.5
8.	Obarijima International School	74	65	76.5
9.	The Living Proof Academy	78	60	69.5
10.	Penniele Academy International School	88	62	75.0
11.	Ranjenny's High School	65	60	62.5
12.	Victor International	65	50	57.5
	Mean for Private Schools	**73.3**	**60.3**	**68.3**

Research Question 4:

What are the effects of ICT resources on the performance of secondary school students?

Table 3.4. Students' performance for ICT application to learning Physics

S/N	INSTITUTION	%RESPONSE
1.	Alode Secondary School	40
2.	Ascension High School	32
3.	Comprehensive High School A	55
4.	Onne Secondary School	60
5.	Aleto High School	42
6.	Ebabu College	38
	Mean for Public Schools	**44.5**
7.	Lion Comprehensive High School	60
8.	Obarijima International School	50
9.	The Living Proof Academy	55
10.	Penniele Academy International School	48
11.	Ranjenny's High School	60
12.	Victor International	65
	Mean for Private Schools	**56.3**

Research Question 5:

To what extent is the difference between the levels of student-instructors in the use of electronic resources for ICT learning compared to in traditional learning system?

Table 3.5. Indications of percentage encouragement and interest in ICT for both students and staff

S/N	INSTITUTION	%RESPONSE		
		STAFF	STUDENTS	MEAN
1.	Alode Secondary School	30	42	36.0
2.	Ascension High School	25	30	27.5
3.	Comprehensive High School A	30	12	21.0
4.	Onne Secondary School	30	25	27.5
5.	Aleto High School	30	42	36.0
6.	Ebabu College	30	20	25.0
	Mean for Public Schools	**29.2**	**28.5**	**28.8**
7.	Lion Comprehensive High School	25	35	30.0
8.	Obarijima International School	20	25	22.5
9.	The Living Proof Academy	30	20	25.0
10.	Penniele Academy International School	30	25	27.5
11.	Ranjenny's High School	20	30	25.0
12.	Victor International	27	20	23.5
	Mean for Private Schools	**25.3**	**25.8**	**25.6**

Table 3.6. Responses on challenges of ICT applications

S/N	Institution	Remarks on challenges to ICT uses
1.	Alode Secondary School	Erratic public power failures
2.	Ascension High School	Erratic public power failures
3.	Comprehensive High School A	Erratic public power failures
4.	Onne Secondary School	Lack of computers for all students
5.	Aleto High School	Lack of experienced ICT teachers
6.	Ebabu College	Too many students for one computer
7.	Lion Comprehensive High School	ICT is Capital intensive
8.	Obarijima International School	Overcrowded computer laboratory
9.	The Living Proof Academy	Poor internet network and power fails
10.	Penniele Academy International School	Overcrowded laboratory and no power
11.	Ranjenny's High School	Lack of qualified or skilled staff for maintenance of equipment
12.	Victor International	Limited number of ICT facilities compared to number of students

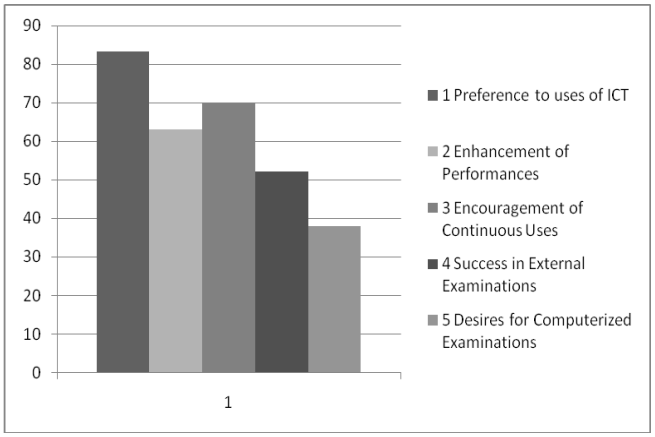

Figure 3.1. Percentages of responses to various applications

Figure 3.2. Newly built Computer Laboratory with no facilities at Victor International high School, Ogale

Figure 3.1 shows that students' desire for application of ICT in public examinations is quite discouraging. This is because the average success in external examinations where ICT examinations are emphasized was about 51.5% and that the desires and interest in computerized examinations was rated as 38%. However, most students interviewed stated that regular teachings with ICT resources were completely absent; hence they could not derive modern benefits of ICT conducted examinations. In contrast, the teachers were of the opinion that regular ICT applications of about 83% will enhance teaching and learning by 63% and that they needed more encouragement, motivations and infrastructure provision.

Figure 3.3. Computer Lesson in session at GSS Onne

3.1. Data Interpretation and Analyses

Table 3.7: Null hypothesis 1

There is no significant relationship between availability of ICT resources in public and private schools as applied to delivering lectures, teaching and online assignments.

Respondents	n	Mean	δ	df	t_{cal}	tcrit	Remarks
Public Schools	6	40.5	8.67	10	3.84	2.23	Significant
Private Schools	6	59.0	8.00				

Null hypothesis 1 fails because both the mean scores and variance were not equal for availability of ICT facilities in public and private secondary schools. Significant differences

existed in the available ICT infrastructures in public and private schools as predicted by t-test in Table 3.7. Besides, Table 3.1 indicates that private schools have more ICT facilities than public schools. However, Tables 3.4 and 3.5 show that the availability of some ICT devices had not assisted in applications to teaching and learning.

Table 3.8: Null hypothesis 2:

There is no significant effect between the level of the qualifications and skills of instructors in the use of ICT resources in electronic learning-education compared with traditional courses system.

Respondents	n	Mean	δ	df	t_{cal}	tcrit	Remarks
Public Schools	6	59.92	3.78	10	3.84	2.23	Significant
Private Schools	6	64.50	4.82				
Staff	12	66.34	3.84	130	1.11	1.98	Significant
Students	120	58.08	0.75				

Null hypothesis 2 is acceptable since the means and variances agreed with the proposal. Both staff and students accepted that certificate qualifications and skills of teachers had no significant effect on instructor's use of ICT resources in electronic teaching system. This is reflected on the values of t-test parameters presented in Table 3.8. Oral interviews equally indicated that the challenges of irregular power supply and cost of private power generations are strong hindrances to ICT uses in education.

Table 3.9: Null hypothesis 3

There is no significant effect on applications of ICT resources to teaching and learning by the teachers in both public and private secondary schools in Eleme LGA.

Respondents	n	Mean	δ	df	t_{cal}	tcrit	Remarks
Public Schools	6	63.33	4.33	10	1.23	2.23	Not Significant
Private Schools	6	68.33	8.96				
Staff	12	75.17	1.17	130	39.72	1.98	Significant
Students	120	56.50	3.83				

Staff and students indicated in Table 3.9 by their views that application of ICT resources to teaching and learning by teachers will have significant impact on mode of teaching and knowledge acquisition if proper ICT environment was provided. The current research has shown that no such effect was observed. For public and private secondary schools in Eleme LGA no significant effect on applications of ICT resources to teaching and learning by the teachers was noticeable as the mean scores and variance were equal. But the teachers' and students' responses show that there are significant differences. This implies that the present system of teaching has significant impact on application of ICT.

Table 3.10: Null hypothesis 4:

There is no significant relationship between the adequacy of communication mode of electronic resources and the level of student's appreciations and applications in both public and private schools.

Respondents	n	Mean	δ	df	t_{cal}	tcrit	Remarks
Public Schools	6	44.00	8.67	10	2.97	2.23	Significant
Private Schools	6	56.33	5.33				

Results from null hypothesis 4 in Table 3.10 posit that there is indeed significant difference between ICT adequacy and the students appreciation coupled with applications. This assertion is derivable from the variations in mean scores and variance.

Table 3.11: Null Hypothesis 5:

There is no significant relationship between the level of interest and encouragement in using ICT resources in reading and learning.

Respondents	n	Mean	δ	df	t_{cal}	tcrit	Remarks
Public Schools	6	28.84	4.78	10	0.72	2.23	Not Significant
Private Schools	6	25.58	2.10				
Staff	12	27.25	1.92	130	0.13	1.98	Not Significant
Students	120	27.17	1.34				

The above table 3.11 shows that public and private schools have mean scores at 28.84% and 25.58% respectively. The standard deviations were 4.78 and 2.10 for public and private schools in order. In addition students and staff of both types of schools responded with mean scores of 27.25% and 27.15% for staff and students respectively; whereas their standard deviations are 1.92 and 1.34. Consequently, the calculated t_{cal} for t-test shown in table 3.11 agrees that there was no relationship between the level of interest and encouragement in using ICT resources in schools in Eleme Local Government area.

3.2. Summary of Findings

The present study has shown that on the average, some information communication and technology facilities are available in most secondary schools in the study area. For example, Onne Secondary School, Onne (Public) and Ranjennys' High School, Ogale (private) have a good number ICT infrastructure but the drive for its application is lacking due to some serious hindrances. This finding supports the works [19-21] in the university system. They submitted that even at higher education levels, challenges such as lack of skills, lack of manpower for facility maintenance and erratic power supply tend to reduce effective and efficient applications of ICT.

It was also observed that lack of skilled and computer literate teachers cum technical staff affected the uses of the available ICT resource facility. This created low interest and morale for the students thereby making applications of ICT to teaching and learning difficult. This observation is similar to that obtained by other researchers, [22-26].

Besides it was revealed that the average success of learners (students) in external public examinations where ICT-applied examinations are emphasized was about 51.5% and that the desires and interest in computerized examinations was rated as low as 38%. Additionally, most students interviewed stated that regular teachings with ICT resources were completely absent; hence one could not derive modern benefits of ICT conducted examinations and learning.

4. Discussions and Conclusions

4.1. Discussions

Table 5.1. Some hindrances to effective adoption of ICT to teaching and Learning Physics in Eleme local government area

S/N	Hindrances
1.	Erratic public power failures
2.	Lack of computers for most students
3.	Lack of experienced ICT teachers
4.	The cost ICT and computers is Capital intensive
5.	Poor internet network and power fails
6.	Overcrowded laboratory without computer
7.	Lack of qualified or skilled staff for maintenance of equipment

A spackling revelation of this study has shown that the secondary schools in Eleme local government area of Nigeria are seriously lagging behind in the degree and quantum of application of information and communication technology in teaching-learning physics. This is traceable to lack of modern ICT infrastructures that are commonly found in developed Nations where education is the driving wheels of their economy. Null hypothesis in Table 4.7 stated that "there is no significant relationship between availability of ICT resources in public and private schools as applied to delivering lectures, teaching and online assignments". Consequently the hypothesis failed after due analyses which pre-supposes that indeed the converse is true.

Secondly the number of teachers sampled in both public and private schools appear to lack necessary skills and computer literacy that would have enabled them develop interest, confidence and imperative motivational acumen for a typical 21st century Physics teacher. The above scenario leaves one with no other alternatives than to revert to the old traditional monde system of teaching and learning that had reduced the educational system in Eleme in particular and Nigeria at large to its current "apparent low standard". It was observed that hypothesis 2, Table 3.8 which states "there is no significant effect between the level of the qualifications and skills of instructors in the use of ICT resources in electronic learning-education compared with traditional course system" succeeded due to its relative comparison with traditional methods of knowledge delivery. It points out that with the traditional mode of teaching and learning physics, skills and qualifications in computer or any other ICT are insignificant. Hypothesis 3 in Table 3.9 concludes that "there is no significant effect on applications of ICT resources to teaching and learning by Physics teachers in both public and private secondary schools in Eleme LGA" and it buttressed the above fact with particular reference to Eleme.

Lastly the investigation identified an array of challenges that are hindering the progress of ICT applications by Physics teachers to secondary schools in Eleme LGA. They are listed below in Table 4.1.

4.2. Conclusions

The use of information communication technology as additional instruments for teaching and learning Physics is lacking in secondary schools in Eleme. However, in some schools (public and private) attempts are being made in a very little way to introduce the concepts of ICT through acquisition and display of computers. It is obvious that efforts are not made to recruit or train teachers with requisite skills to take care of the ever increasing demand for modern education techniques. The use of such new techniques and technology is increasing, and it is becoming very fashionable and possible to deliver training and teaching to mixed audience with diverse cultures and status through such easier means. In contrast, schools in Eleme are yet to catch up with the new world as the ICT facilities are not functional, the capacity for its applications by both students and teachers are at very low level. Irrespective of these challenges both staff and students perceive and understand the abundant benefits in using ICT for education purposes.

Consequently, the modern technological and scientific world order will not wait for the schools in Eleme to meet up with ICT development in education. Rather it is necessary that Eleme local government, Rivers State, Federal government of Nigeria and in particular individuals alike should seek to create and develop communities and cultures that place high premium on the application of information and communication technology to teaching and learning. Therefore policies of government should be channeled toward curriculum development that attracts the use of ICT, teachers re-training programme that will take care of teachers' deficiencies in ICT's skills and above all rewarding packages for such teachers will serve as motivational ingredients.

4.3. Limitations

Funds, time and small sample population size served as limiting factors in the current study. For example, Eleme LGA has only six public secondary schools and eight private schools that currently teach and study physics. The entire curriculum in Physics had not been fully covered with the implications of possible ICT involvement in teaching Physics.

4.4. Recommendations

1. There is urgent need for the development of an ICT friendly curriculum in Physics and other subjects in Nigeria Secondary schools. This will provide the pathway for easy application of ICT in teaching and learning.

2. Policies on application of ICT in secondary schools should be established, widely publicized and implemented.

3. Re-training of teachers for acquisition of ICT knowledge and skills should be made compulsory and mandatory for all registered professional teachers at all levels.

4. All newly employed teachers should be made to undergo ICT-skill acquisition courses before assuming active service.

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