Science, Technology & Public Policy
2025, Vol. 9, No. 1, pp. 63-70
https://doi.org/10.11648/j.stpp.20250901.16

Research Article

Teachers Perceived Difficulties in Implementing Core Curriculum Minimum Academic Standards on Cyber Security Education

Toochi Chima Ewunonu[1], Chukwuemeka Etus[2] *, Anthony Ifeanyi Otuonye[2], Ikenna Ajare[2], Ikechukwu Harrison Ezeh[1], Obi Chukwuemeka Nwokonkwo[2]

[1]Department of Cyber Security, Federal University of Technology Owerri, Ihiagwa, Nigeria

[2]Department of Information Technology, Federal University of Technology Owerri, Ihiagwa, Nigeria

Abstract

This paper is designed to identify the teachers' perceived difficulties in implementing Core Curriculum Minimum Academic Standards (CCMAS) on Cyber Security Education. The scope of the study covered all the Cyber Security lecturers in the department of Cyber Security, School of Information and Communications Technology, SICT, Federal University of Technology, Owerri, FUTO. The study is descriptive research that employed the population survey design. Using four research questions and two hypotheses as guide, 30 respondents formed the population. A self-developed and validated questionnaire was used as an instrument for data collection and face to face method of questionnaire administration was adopted. The instrument was validated, and Pearson's Product Moment Correlation Coefficient was used to test reliability which yielded a coefficient index of 0.85, the instrument was therefore judged to be reliable. The data collected was tallied, from which inferences and generalization were made. Descriptive statistics of weighted mean were used in answering the research questions and t-test used for the hypotheses. The data collected were analyzed and the following findings were made teachers' lack of knowledge of CCMAS, Lack of instructional materials, large class size and lack of adequate time for a lesson are obstacles to teachers' implementation of CCMAS. With regards to the above findings, implications for findings and recommendations were proffered.

Keywords

CCMAS, BMAS, Cyber Security Education, SICT, Teacher Centered, Learner Centered

1. Introduction

The Core curriculum evolved as a reaction against the compartmentalization of knowledge which characterized the subject centered curriculum. Launched on 5th December 2022, by the immediate past Vice president, Prof Yemi Osibanjo, one basic feature was the inclusion of skills and soft skills acquisition with emphasis on employable skills for the 21st century. The focus of the CCMAS design was making learning satisfy the social functions of the learner which is organized around problems of the society and thus, it is an instrument for social reconstruction and improvement [1].

Its design also develops integration to serve the needs of the students, promote active learning and significant relationship

*Corresponding author: chukwuemeka.etus@futo.edu.ng (Chukwuemeka Etus)

Received: 26 March 2025; **Accepted:** 2 April 2025; **Published:** 23 June 2025

between life and learning [2]. Core curriculum minimum academic standards (CCMAS) promotes students' creativity, increases their problem-solving abilities and introduce them to the world of Information and Communications technologies with the main purpose of broadening their horizon and helping them to make better choices in their career pursuit [1]. However, Cyber Security Education has been an integral part of national development strategies in many societies because of its impact on productivity and economic development. Despite its contributions, the leaders of Nigeria have not given this aspect of education the attention it deserves. This could be one of the reasons for the nation's under development [3].

The study is delimited to lecturers of Cyber Security in institutions of higher learning. The population included all teachers of Cyber Security in the department of Cyber Security, School of Information and Communications Technology, Federal University of Technology, Owerri, FUTO who were active at the time of this study. The various obstacles to implementing CCMAS were delimited to: Teachers' lack of knowledge of CCMAS, lack of appropriate instructional materials, large class size and lack of adequate time for lessons.

1.1. Objectives

The aim of this paper, therefore, is to ascertain teachers' perceived difficulties in implementing CCMAS on Cyber Security Education. The specific objectives are to find out whether or not:

i. Teachers' lack of knowledge of CCMAS is an obstacle to implementation in teaching Cyber Security Education.

ii. Lack of instructional materials is a contributing factor towards the teachers' difficulty in implementing CCMAS in teaching Cyber Security Education.

iii. Large class size is a challenge to teachers' implementation of CCMAS in teaching Cyber Security Education.

iv. Lack of adequate time for a lesson poses a challenge to implementation of CCMAS in teaching Cyber Security Education.

1.2. Research Questions

1. To what extent is teachers' lack of knowledge of CCMAS an obstacle to teaching Cyber Security Education?

2. To what extent is the lack of Instructional materials an obstacle to teachers' implementation of CCMAS in teaching Cyber Security Education?

3. To what extent is large class size an obstacle to teachers' implementation of CCMAS in teaching Cyber Security?

4. To what extent is lack of adequate time for a lesson an obstacle to teachers' implementation of CCMAS in Cyber Security?

1.3. Hypotheses

The following hypotheses were formulated to give directions to the research:

Ho_1: There is no significant difference between male and female teachers in their perception of large class size as an obstacle in the implementation of CCMAS.

Ho_2: There is no significant difference between male and female teachers in their perception of lack of adequate time for a lesson as an obstacle to the implementation of CCMAS.

2. Literature Review

2.1. Conceptual Framework

According to the Student Handbook and Information guide [4], The Cyberspace is the hypothetical environment in which communication over computer networks occurs. Technically, Cyberspace includes computer systems and networks, the physical infrastructure and telecommunications devices that allow for the connection of smart phones, tablets, computers, servers, SCADA devices, etc.

The Cyberspace has become a critical infrastructure for all countries because of the numerous Internet and Cloud computing applications vital to most human activities such as banking, commerce, government, education, medicine, transportation, military, politics, etc. The knowledge areas of Cyber Security are obtained from Computer Science, Software Engineering, Electronics, Communication and Computer Engineering, Forensic Science, Data Science, Law, and Criminology. The possible areas of specialization are Cyber Security Analysis, Information System Security, Ethical Hacking, Network Security, Digital Forensics and Auditing. Degrees and qualifications obtainable include Bachelor's Degree (B. TECH), Masters' Degree (M. Sc) and even Doctor of Philosophy (Ph. D). The following are some of the important options for employment open to graduates of Cyber Security Programme in public and private organizations: Information Security Officer, System Analyst, Incident Response Expert, Penetration Tester, Ethical Hacker, Cyber-Risk Analyst, Network/Database Administrator, Forensic Expert Analyst etc. Candidates may be admitted into a 5-year degree programme in Cyber Security programme through one of the following ways: The Unified Tertiary Matriculation Examination (UTME) or Direct Entry Mode [4].

Thus, Traditional methods of teaching or oral Lecture method (LM) of teaching has been observed to be in use in various institutions of learning where various innovative courses such as Cyber Security is taught [1] (FUTO, 2024). The traditional method of teaching according to [5], is defined as a teaching technique in which one person usually the teacher presents a spoken discourse on a particular subject. It is the expository method which is an age-long traditional method of teaching in which knowledge or information is presented, conveyed, imparted or transferred to learners by the teachers with the expectation that the latter should be able to regurgitate on demand, a rote-memory stored knowledge as presented by the teacher [6]. These were some of the features

of the Benchmark Minimum Academic Standards (BMAS) which have been in use in institutions of higher learning over the years. Table 1 shows some basic differences between CCMAS and BMAS.

Table 1. BMAS VS CCMAS (FUTO 2024).

BMAS	CCMAS
Teacher centered	Learner centered
Teacher is a sage on stage who disseminates facts and information	Teacher is a learner and facilitator
Passive reception in learning	Active participation in learning
Knowledge is sacrosanct and fixed	Learning is dynamic and takes place anywhere in the school
Teaching and assessment are separate	Teaching and assessment are intertwined
Textbooks are the dominant teaching and learning resources	Instructional materials of diverse forms are dominant

2.2. Empirical Framework (Related Works)

However, a study conducted by [7, 8], a meta-analysis of 225 studies comparing "Constructivist versus Exposition centered course designs" in Science and Mathematics courses using students' scores on examinations concepts inventories and assessments found out that students taught in traditional lectures were 1.5 times more likely to fail than students taught based on the core curriculum standards. Furthermore, on average, students' performance on exams, concepts inventories increased by 0.47 Standard deviation when CCMAS were introduced.

Sowunmi conducted a study on Games based on CCMAS and improved Basic science teaching in Nigeria Schools [9]. The study employed the Pre-test, Post-test experimental control groups design which comprised of two intact classes. A research instrument "Science Entry" (SE) was used for the Pre-test and the Post-test. The data collected was analyzed using t-test. The hypothesis formulated was tested at 0.05 level of significance. The t-test analysis of the post-test revealed that there was significant difference in the performance of learners. The results of this study suggested that the use of Animation Games based on CCMAS made a significant impact on the performance of learners compared to the traditional chalk and talk approach.

In a report, [10] described how improved teaching methods increased students' retention and improved performance in Science, Technology, Engineering and Mathematics (STEM) courses. One study described in the report found that students in traditional lecture courses were twice as likely to leave Basic Sciences and three times as likely to drop out of college entirely compared with students taught using improved teaching methods based on Core Curriculum Minimum Academic Standards.

On the other hand, little or nothing has been done to address the Teachers perceived difficulties in implementing CCMAS in Sciences, Engineering, Information and Communications Technology Education in developing nations like Nigeria [1, 2]. It is on this premise that the paper on Teachers perceived difficulties in implementing Core Curriculum Minimum Academic Standards on Cyber Security Education in Nigerian institutions of higher learning becomes highly imperative.

3. Materials and Methods

3.1. Research Design

The present study is a descriptive survey research and used the population survey design. It used the population survey design because all the members of the population (30 Cyber Security teachers) were involved in the research [11].

3.2. Population of Study

All the members of the population (30 Cyber Security teachers in the department of Cyber Security, SICT, FUTO) were involved in the research. The ratio of male to female teachers was 70:30 with age range of 25 to 60 years. The teachers were predominantly Christians and possessed a minimum of B. SC qualification in Information and Communications related courses.

3.3. Sample and Sampling Techniques

The present research used the population survey design. As a result, all the members of the population were involved in the research (30 Cyber Security teachers). There was thus no need for a sample size and use of a sampling technique [11].

3.4. Data Collection Instrument

A 20-item researcher developed structured questionnaire titled "Teachers Perceived Difficulties in implementing CCMAS" was used to obtain data. The response pattern for the items was based on a modified four-point Likert Scale, vis-a-viz: Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). For positive statements, the following scoring pattern was used: Very high extent-4 points, High extent-3 points, Low extent- 2 points, and very low extent-1 point.

3.5. Validity of the Instrument

The instrument was scrutinized for face and content validity by two experts in Measurement and Evaluation. The clarity of the language and the ability of the questionnaire items to elicit relevant information or responses was also checked by

the validators. Modifications were made by the researcher based on the evaluator's comments.

3.6. Reliability of the Instrument

The reliability of the instrument for data collection was ensured using the test-retest method. The result of the first and second test was analyzed using Pearson Product Moment Correlation Coefficient and upon correlation, reliability co-efficient of 0.85 was obtained which proved to be high enough to establish the reliability of the instrument.

3.7. Method of Data Analysis

The data collected was analyzed using descriptive statistics of weighted mean to answer the research questions. In analyzing the data collected through the questionnaire, weighted mean ratio was adopted. The mean score which is above 2.5 was accepted while below 2.5 was rejected. The scoring policy was as follows: Very high extent-4 points, High extent-3 points, Low extent- 2 points, and Very Low extent-1 point, Total - 10 points. Therefore, Mean (X) = ∑X/N = 10/4 =2.5. This means that any item scoring 2.5 and above is considered significant and accepted while item scoring below 2.5 is considered in-significant and was rejected. The t-test was used to analyze the data for the two null hypotheses which were tested at 0.05 level of significance.

4. Results

4.1. Research Question One

To what extent is teachers' lack of full knowledge of CCMAS an obstacle to teaching Cyber Security Education?

Table 2. *Data on Extent to which teachers' lack of knowledge of CCMAS is an obstacle to implementation of CCMAS.*

ITEMS	VHE 4	HE 3	LE 2	VLE 1	Total	$\bar{X}$	Remark
Teachers' lack of CCMAS knowledge to teach is an obstacle	21	9	0	0	30	3.7	Accept
Lack of CCMAS application knowledge is hindrance to teachers using it to teach	19	11	0	0	30	3.6	Accept
Teachers' lack of subject knowledge is an obstacle to the use of CCMAS in teaching	20	10	0	0	30	3.6	Accept
Teachers' lack of knowledge of selecting appropriate instructional strategy is an obstacle to implement CCMAS	15	15	0	0	30	3.5	Accept
Teachers' non possession of knowledge of how to efficiently interpret the CCMAS to the students is an obstacle to using it to teach	18	12	0	0	30	3.6	Accept
						3.6	

Grand mean = 3.7+3.6+3.6+3.6+3.5 = 3.6

Table 2 shows the questionnaire items and responses of teachers for answering research question one. Data in Table 1 shows that the grand mean for the five questionnaire items is 3.6. Since the grand mean (3.6) is greater than the mean (2.5) which is the yardstick for making comparism, it can be concluded that the research question one is answered positively. It can further be concluded that for the respondents of this present study, teachers' lack of full knowledge of CCMAS to a very high extent is an obstacle to teaching Cyber Security Education.

4.2. Research Question Two

To what extent is lack of Instructional materials an obstacle to teachers' implementation of CCMAS in teaching Cyber Security Education?

Table 3. *Data on the extent to which lack of Instructional materials is an obstacle to teachers' implementation of CCMAS in teaching Cyber Security Education.*

ITEMS	VHE 4	HE 3	LE 2	VLE 1	Total	$\bar{X}$	Remark
Absence of required textbooks hinders the implementation of CCMAS in teaching Cyber Security	24	6	0	0	30	3.8	Accept
Absence of lab equipment is obstacle in implementation of CCMAS in teaching Cyber Security.	21	5	3	1	30	3.5	Accept
Unavailability of ICT devices hinder the teaching of Cyber Security wrt CCMAS	20	9	1	0	30	3.6	Accept
Teaching Cyber Security to CCMAS standard is hindered by obsolete nature of instructional materials.	18	12	0	0	30	3.6	Accept
Inability of teachers to improvise required instructional materials affect teaching Cybersecurity to CCMAS standards	10	10	10	0	30	3.0	Accept
						3.5	

Grand mean = 3.8+3.5+3.6+3.6+3.0 = 3.5

Table 3 shows the questionnaire items and responses of teachers for answering research question two. Data in table 2 shows that the grand mean for the five questionnaire items is 3.5. Since the grand mean (3.5) is greater than the mean (2.5) which is the yardstick for making comparism, it can be concluded that the research question two is answered positively. It can further be concluded that for the respondents of this present study that lack of Instructional materials is an obstacle to teachers' implementation CCMAS in teaching Cyber Security Education.

4.3. Research Question Three

To what extent is large class size an obstacle to teachers' implementation of CCMAS in teaching Cyber Security?

Table 4. *Data on Extent to which large class size is an obstacle to teachers' an obstacle to teachers' implementation of CCMAS in teaching Cyber Security.*

ITEMS	VHE 4	HE 3	LE 2	VLE 1	Total	$\bar{X}$	Remark
Implementation of CCMAS is effective where population of students is 50 & above	3	0	4	23	30	1.4	Reject
Large classes where teachers have limited control hinder effective implementation of CCMAS	20	10	0	0	30	3.7	Accept
Large class encourage rowdiness which in turn affects implementation of CCMAS	22	8	0	0	30	3.7	Accept
CCMAS is best implemented when the population of students is 40-45	23	3	4	0	30	3.6	Accept
Implementation of CCMAS is not effective when students class size is between 50-60.	17	13	0	0	30	3.5	Accept
						3.2	

Grand mean= 1.4+3.7+3.7+3.6+3.5=3.2

Table 4 shows the questionnaire items and responses of teachers for answering research question three. Data in Table 3 show that the grand mean for the five questionnaire items is 3.2. Since the grand mean (3.2) is greater than the mean (2.5) which is the yardstick for making comparism, it can be concluded that the research question three is answered positively. It can further be concluded that for the respondents of this present study that large class size is an obstacle to teachers' implementation of CCMAS in teaching Cyber Security Education.

4.4. Research Question Four

To what extent is lack of adequate time for a lesson an obstacle to teachers' implementation of CCMAS in Cyber Security?

Table 5. *Data on Extent to which lack of adequate time for a lesson is an obstacle to teachers' implementation of CCMAS in Cyber Security.*

ITEMS	VHE	HE	LE	VLE	Total	$\bar{X}$	Remark
Large amount of time required to efficiently teach Cybersecurity to CCMAS	24	6	0	0	30	3.7	Accept
Implementing CCMAS is hindered by insufficient time	25	3	0	0	30	3.9	Accept
Large amount of time required to plan implementation of CCMAS hinders its use in teaching	20	10	0	0	30	3.6	Accept
Large course content to be covered in a short period of time hinders the implementation of CCMAS.	18	12	0	0	74	3.6	Accept
Time to spend planning for activities discourage the implementation of CCMAS	27	3	0	0	74	3.9	Accept
						3.7	

Grand mean= 3.7+3.9+3.6+3.6+3.9 =3.7

Table 5 shows the questionnaire items and responses of teachers for answering research question four. Data in table 4 shows that the grand mean for the five questionnaire items is 3.7. Since the grand mean (3.7) is greater than the mean (2.5) which is the yardstick for making comparism, it can be concluded that the research question four is answered positively. It can further be concluded that for the respondents of this present study that lack of adequate time for a lesson is an obstacle to teachers' implementation of CCMAS in teaching Cyber Security Education.

4.5. Hypotheses Testing

Null hypothesis (Ho1): There is no significant difference between male and female teachers in their perception of large class size as an obstacle in the implementation of CCMAS. To test this hypothesis, questionnaire items 11-15 were subjected to t -test analysis.

Table 6. *t-test analysis of the difference between mean scores of male and female teachers in their perception of large class size as an obstacle in the implementation of CCMAS.*

Group	N	$\bar{X}$	SD	df	t-cal	t-critical	Decision
Male	21	5.25	5.30	28	1.7	2.3	No Sig. Diff.
Female	9	2.20	2.53				$p<0.05$

Table 6 shows the t-test analysis of the difference between male and female teachers in their perception of large class size

as an obstacle in the implementation of CCMAS. Data in table 5 shows that the calculated t_{cal} (1.70) is less than the table t (2.30) at 0.05 level of significance. This resulted in the acceptance of the null hypothesis and rejection of the alternate hypothesis. It can thus be concluded that for the respondent of this present study there is no significant difference in their perception of large class size as an obstacle in the implementation of CCMAS.

Null Hypothesis 2 (Ho2): There is no significant difference between male and female teachers in their perception of adequate time for a lesson in the implementation of CCMAS. To test this hypothesis, questionnaire items 16-20 were subjected to t -test analysis.

Table 7. *t-test analysis of the difference between mean scores of male and female teachers in their perception of adequate time for a lesson as an obstacle in the implementation of CCMAS.*

Group	N	$\bar{X}$	SD	df	t-cal	t-critical	Decision
Male	21	5.25	6.61	28	1.84	2.30	No Sig. Diff.
Female	9	2.25	3.2				p<0.05

Table 7 shows the t-test analysis of the difference between male and female teachers in their perception of adequate time for a lesson in the implementation of CCMAS. Data in table 6 shows that the calculated t (1.84) is less than the table t (2.30) at 0.05 level of significance. This resulted in the acceptance of the null hypothesis and rejection of the alternate hypothesis. It can thus be concluded that for the respondent of this present study, there is no significant difference in their perception of lack of adequate time for a lesson as an obstacle to their use of active learning instructional strategies.

5. Discussion

The findings in Table 1 showed that research question one was answered in the affirmative. This finding is in line with those of [8] which found that teacher's lack of knowledge of instructional strategies is one of the greatest barriers to their use of the strategies.

The findings in Table 2 showed that research question two was answered in the affirmative. These findings are in support with the conclusions of [12] that students are highly motivated to learn when they see concepts that are being presented to them. The findings are further in line with those of [12] also that students/learners require stimulation to learn via variety of instructional materials for effective delivery of instructions.

The findings in Table 3 showed that research question three was answered in the affirmative. This finding is in line with [8] study that overcrowded classrooms is a major obstacle to the implementation of core curriculum and Active learning instructional strategies. The findings are also in agreement with [13] that discussions are hard to manage and working with very large groups is a daunting task in a class of over 50 students.

The findings in Table 4 showed that research question four was answered in the affirmative. This finding is in line with [14] that too much pre-class preparation time are required to implement core curriculum standards. These findings are also in concord with [15] that large class size is a hindrance, set back and major obstacle to using active Core curriculum instructional strategies.

In null hypothesis one, t calculated (1.70) is less than the t tabulated (2.30). For the null hypothesis two, t calculated (1.84) is also less than the t tabulated (2.30). The findings from this study show that there are no significant differences in teachers' perception of large class size and lack of adequate time for lessons as an obstacle in implementation CCMAS. These findings on the hypotheses are in line with [6] and [16] that social factors such as teachers' personality, knowledge of the subject matter, teaching methods, managerial skills and teacher student relationship affect teachers' utilization of instructional strategies and standards. Thus, neither the chronological age of teachers, sex, nor location of schools or localization is an obstacle or hindrance to effective delivery of instruction. A teacher who recognizes individual differences and involves students actively in the class and managerial activity helps to facilitate learning.

6. Conclusion

This study found that teachers' lack of knowledge of CCMAS, instructional materials, large class size and lack of adequate time for a lesson are obstacles in implementing Core Curriculum Minimum Academic Standards (CCMAS) on Cyber Security Education. The implications are that teachers will still be using outdated instructional strategies that are not learner centered, get discouraged to implement CCMAS when proper instructional materials are lacking, as appropriate and adequate instructional materials can motivate teachers to use CCMAS. Teachers get overwhelmed when trying to coordinate large number of students in order to implement CCMAS thus they stay within less tasking ways of teaching like the lecture method.

Therefore, it is recommended that departments/schools should hold workshops, seminars, and lectures for already teaching staff to ensure that there is a widespread campaign for CCMAS in delivery of instructions. Curriculum planners are enjoined to restructure the curriculum as well as school timetables to ensure adequate time for lessons so that CCMAS instructional strategies can be incorporated. The school community should work in collaboration with the government to bring the school environment to be more conducive by constructing additional classes to bring the number of students in the classrooms to the average standards. Above all, government and all stakeholders should increase and improve funding of education and provision of adequate instructional materials to facilitate proper, solid, and dependable foundation for Cyber Security education in schools.

Abbreviations

CCMAS	Core Curriculum Minimum Academic Standards
BMAS	Basic Minimum Academic Standards
SICT	School of Information and Communication Technology
FUTO	Federal University of Technology Owerri
SCADA	Security Control and Data Acquisition
UTME	Unified Tertiary Matriculation Examination
LM	Lecture Method
SE	Science Entry
PCAST	President's Council of Advisors on Science and Technology
STEM	Science, Technology, Engineering and Mathematics
VHE, HE, LE, & VLE	Very High Extent, High Extent, Low Extent and Very Low Extent
Ho1	Null Hypothesis
Ha1	Alternate Hypothesis

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] FUTO, (2024). The Core Curriculum and minimum academic standard (CCMAS) document. Owerri: Senate Chambers.

[2] Izuagba, A. C., Afurobi, A. O., & Ifegbo, P. C. (2016). Constructivism: The Pedagogy for the 21stcentury classroom. Owerri: Cel-Bez Publishing Co. Ltd.

[3] Pantami, I. A. I. (2022). Cyber Security initiatives for securing a country. Ibadan: University Press plc.

[4] Cyber Security Depit. (2023). Student Handbook and Information Guidefor Bachelor of Technology (B. TECH) programme in Cyber Security. Owerri: Transfiguration pub.

[5] Jummai H. D (2012). Effect of Activity based instructional strategy on the academic performance of students in Integrated Science in junior secondary schools in Kaduna State (Unpublished M. SC thesis). Ahmadu Bello University, Zaria-Nigeria.

[6] Ewunonu, T. C. (2017). Teachers practice in using Active Learning Strategies in enhancing learning among slow learners in Owerri (Unpublished PGDE Thesis). Alvan Ikoku Federal College of Education, Owerri, Imo state.

[7] Freeman S., Eddy S. L. McDonugh, M., Smith M. K. Okoroafor N., Jordt H. & Wenderoth M. P. (2014). Active learning increases student performance in science, engineering and mathematics. Proceedings of the national Academy of Sciences USA III; 8410-8415.

[8] Aksit, F., Niemi, I. T & Nevgi, A. (2016). Why is active learning so difficult to implement: The Turkish case? Australian Journal of Teacher Education, 41(4), 18-30.

[9] Sowunmi O. & Aladejana F. (2016). Simulation and Games and Improved Basic Science Teaching in the Nigerian Schools. West East Journal of Social Sciences 2(2), 117-122.

[10] Presidential council of advisors on Science and Technology (2012). Engage to excel: Producing one million additional college graduates with degrees in STEM. http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel final_feb.pdf

[11] Osuala, R. C. &Ihekwaba, C, N. (2014). An introduction to research methods and guide to research project reports (2nd ed): Peacewise System Owerri.

[12] Opara P. N. & Etukudo D. U. (2014). Factors affecting teaching and learning of basic science and technology in primary schools. Journal of educational policy and entrepreneurial research (JEPER) 1(1, 46-58.

[13] Omiko A. (2016). An Evaluation of classroom experiences of basic science teachers in secondary schools in Ebonyi State of Nigeria. British Journal of Education. 4(1), 64-76.

[14] Jim, G. P. (2010). E-Learning In Nigerian Higher Institutions: The Precursor To Sustainable National Development.

[15] Altinyelken, H. K. (2011). Student centered pedagogy in Turkey: conceptualizations, interpretations and practices. Journal of Education Policy, 26(2), 137-160.

[16] Obilor, N. C. (2019). Teachers perceived difficulties in using active learning instructional strategy in teaching basic science students. (Unpublished PGDE Thesis). Alvan Ikoku Federal College of Education, Owerri, Imo state.