

SUB THEME: TECHNIQUES IN ASSESSMENT USING BIG DATA

TITLE OF ARTICLE:

THE BIG DATA: PRIMARY SCHOOL TEACHERS' KNOWLEDGE OF TECHNIQUES FOR ASSESSMENT OF PUPILS ACADEMIC PROGRESS IN SOUTH EASTERN NIGERIA

DR UMOR IWELE MORRISON

08068269982

umormorrison@gmail.com

DEPARTMENT OF EDUCATIONAL FOUNDATIONS

FEDERAL COLLEGE OF EDUCATION (TECHNICAL), ASABA, DELTA STATE

AND

DR EBELECHUKWU, P. ELUI

08033227086

eluebelechukwu@yahoo.com

DEPARTMENT OF PRIMARY EDUCATION

FEDERAL COLLEGE OF EDUCATION (TECHNICAL), ASABA, DELTA STATE

Abstract

The study focused on primary school teachers' knowledge of techniques for assessment of pupils' academic progress using big data. It was premised on the increasing knowledge and use of modern technology in virtually every area of human endeavor which demands that everyone who deals with the collection, analysis, storage and retrieval of information on people's activities should be well informed of the knowledge of processing and application of software to achieve expected results in using big data when wider coverage is required. Descriptive expo facto design was adopted in the study. Two research questions and two hypotheses guided the study. The population of the study comprised all teachers in the public primary schools in Anambra State, South Eastern Nigeria. 400 hundred respondents selected from eight educational zones within the state constituted the sample. The instrument for data collection was a structured questionnaire entitled: "Primary School Teachers Knowledge on Techniques and Use of Big Data" (PSTKTUBD) developed by the researchers. It was a 21-item instrument with a 4-point rating scale. 400 copies of the instrument were administered and all were retrieved. Mean scores and standard deviation were used to answer the research questions while t-test statistical tool was used for the testing of hypotheses. Results from the study revealed that primary school teachers in Anambra state Nigeria have no basic knowledge and use of computer appliances for the assessment of pupils' academic progress report. Findings also showed that majority of teachers (79%) in primary schools do not own computer systems, are not ICT friendly, do not have digital data base of their pupils' and do not use the computer to analyze data on pupils' academic activities and progress. It was further revealed that public primary schools lack ICT facilities, hence talking about big data remained a flight of the imagination. Results from the study also revealed that primary school teachers in the state have no basic knowledge of big data, its 'analytics tools and techniques for assessment of pupils' academic progress. The findings have

implications on assessment in the primary school and teacher preparation programmes. Based on the results, it was recommended, amongst others, that every teacher should own a laptop and be ICT compliant, government should retrain teachers regularly on ICT skills and use of the internet services for teaching and learning. Furthermore, Teacher Education curriculum should be revised and instructional resources for preparing teachers in the digital age be installed.

Introduction

Assessment is an activity of evaluating learner's achievement. It has been used over time to ascertain learners progress and thus indispensable to the teaching and learning process. For years now, researchers have made overall recommendations for quality classroom assessment. Among such recommendation include that teachers ought to take performance-based assessment, beyond traditional paper and pencil testing. Teachers should develop assessment activities that relate to their core instructional goals and instructional strategies and make use of formative assessment which is for learning, instead of summative assessment of learning at the end. Currently the answers to assignments and examinations are the only measurement on the performance of students (datafloq.com)

Educational systems across the world are undergoing innovations to change the ways they assess in the classroom during instruction, particularly with old style instructional practices that usually ask learners to work individually on examinations that require them to remember facts or answers to pre-designed challenges within the constructed borders of individual school focuses.

Modifications presently ongoing support what is being taught, how it is learned and how it is assessed in innovative ways that help engage individual learning.

Classroom assessments aspire to affect learning by improving feedback to learners and teachers are different from summative assessments because they are directed during facilitation process and have effect on learners' grades. This analytic tactic that provides feedback to teachers and learners is the logical approach of formative assessment and if applied properly has been shown to increase learner attainment (Costa & Kallick, 2001). According to OECD (2008), formative assessment builds students' "learning to learn" skills by:

- Placing emphasis on the process of teaching and learning, and actively involving students in that process.
- Building students' skills for peer- and self-assessment.
- Helping students understand their own learning, and develop appropriate strategies for "learning to learn".

The introduction of continuous assessment as an integral part of pupil's academic progress report and as a basis for the assessment and placement of pupils at the primary level of education (Federal Republic of Nigeria {FRN, 2004) makes it mandatory for all teachers to have basic knowledge and skills of computer and information and communication technology (ICT) in general. This becomes so important because continuous assessment is a progressive and consistent comprehensive record of a pupil in all school activities in and out of the classroom situation. It involves records that cover the three domains of learning; the cognitive, affective and the psychomotor domains. According to Falayo in Ahukanna, Onu and Ukah, (eds), continuous assessment is the mechanism whereby the final grading of learners in cognitive, affective and psychomotor domains of learning systematically takes account of their performance during a given period of schooling. In other words, continuous assessment is comprehensive cumulative and diagnostic, perhaps, it is on the bases of the above that UNESCO (2017) see it as both formative and summative. Be that as it may, practitioners are expected to have adequate

knowledge and adopt innovative approaches in the system in order to achieve valid and reliable records. One of such approaches is the Big Data.

We are living in the era of data. There are a lot of Massive Open Online Courses(MOOC) that are generating lots of data. Data is generated almost from every sector including education. Hence education sector is becoming technology oriented. Big data is a new phenomenon that centers on the use of data to inform the quality of instruction and research (Picciano,2012). It refers to large and disparate volumes of data generated by people, application and machines. Big data is gaining attention from many domains. It can be used in education to support learning, teaching and administration (Complex,2015).

According to Bolohan & Ciobanu (2013), the big data is an extremely large data sets that has grown beyond the ability to manage and analyze them with traditional data processing tools but requires adequate knowledge and skills to be able to manipulate the process in order to access, process and analyze necessary information that aids decision making. Furthermore, Gartner IT Glossary (2017) views big data as high volume high velocity and high variety information assets that demand cost effective, enhanced insight and innovative forms of information processing that enable enhanced decision making and process automation.

The availability of large volume of data has led to the evolution of learning analytics in the first decade of the 21st century. As data sets available to researchers became larger and larger, researchers started looking for better ways to measure and analyze how learners approach and understand new knowledge

in various educational environments. This is called learning analytics or data analytics. Wikipedia defines data analytics as the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environment in which they stay. To Sanyika et al(2011),it refers to the various forms , techniques and approaches used to process, manipulate and generate useful insights or outcomes from data. Big data and analytics are two critical concepts that has emerged in this era when society is generating data in large volumes. Learning analytics is different from other pedagogical theories because it focuses on understanding how learners react to different educational contexts by studying large amounts of data about learners and their environment. and on that basis, forecasting can be done. With the rise of more online education and development of massive open online courses, all the data assume a completely new meaning. Researchers use various tools to understand the quality of students and how to develop the course structures so that the pupils will benefit from instruction. Kalota(2015) suggests that big data techniques should be used in education to allow institutions understand challenges that students face and identify strategies to address them.

The availability of large education data has provided researchers with opportunities to use automated tools and techniques to explore. These tools like Algorithms, Netlogo, Augmented Reality, Online Games, BYOD, SNAPP, LMS,

Virtual Reality, Rapid Miner, TOM, SPUNK etc. together with others generate lots of data which can be stored and used by teachers in the primary school to assess pupils' progress. It can revolutionize the way assessment is carried out in the classroom by improving students results, creating mass customized programs, improve the learning experience in real time ,reduce dropouts and increase results, aid interchange of data between schools and help identify pupils with special needs.(Rijmenam,2018,Waish,2012).

Since big data is a new trend in the field of education, are teachers in developing countries aware and conversant with this data driven approach in their teaching and learning ? Kalota (2015) feels that while big data can provide big benefits, it is important that institutions understand their own needs, infrastructure, resources and limitations before jumping into the big data bandwagon.

One of the problems confronting the developing countries of the world, especially African countries, is lack of comprehensive data base of the citizens and lack of credible structures. This is very critical in the education sector as it is a major determinant of the developmental plan of a nation. It is of more importance when it bothers on the information and progress report of school children as educational outcomes are usually cumulative and demands that it should be comprehensive for it to make valid and reliable report about those concerned. Getting dependable records for decision making on school children becomes fictitious without a very comprehensive and digitalized system of taking, storing and retrieving information beyond pen and paper approach. This, perhaps, informed the introduction of Information and Communication

Technology (ICT) into the education sector. The use of ICT in schools now is a common practice globally. In spite of the relevance and necessity of the use of ICT in schools, some countries are still struggling with the development, in their efforts to reposition education systems, due to several factors including government's attitude to the development and weak policies.

Nigeria is one nation that has been struggling seriously to reposition her education system in order to attain global standards, practices and recognition. Part of the efforts is the publication of revised copies of the national policy on education in 1981, 2004 and 2013. One of the most significant changes in the document is the introduction of computer studies in 1981 as compulsory subject in the basic education scheme (Federal Republic of Nigeria, 1981). That was amplified to be a major condition for the attainment of employment opportunities. By implication, every member of the society, particularly those in the academic environment, whether primary, secondary or tertiary, is expected to become computer literate to enable him/her function efficiently in his/her role performance. The meaning of big data and the gains thereof show that much is needed by users to be able to use it efficiently and effectively. It demands adequate knowledge and skills in ICT to achieve worthwhile results. This is because big data deals with capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating and information privacy. A person who is not adequately informed in ICT may be found wanting in using big data for assessment of students/pupils, especially in societies where adequate data base of students/pupil's lack and enrollment is unprecedented. However, any government bent on asking teachers to engage ICT services and indeed digital technology for assessment of students/pupil's academic progress, which is imperative in this digital age, must also engage the teachers in ICT training to enable them become functional and effective in their role performance. This perhaps lacks in Nigeria. According to Abejehu (2016) feedback delivery system used by

primary school teachers seems to lack consistency. This is, perhaps, due to their use of traditional computation and assessment methods and techniques without recourse to the use of computer and ICT appliances. According to Morrison, Amaefula and Ogoegbunam (2017), Nigeria has a high desire and need for digital experience but firmly down plays it when it comes to practical terms. Teacher education in Nigeria does not give ICT practical attention commensurate to the emphasis in the national policy on education of the nation; which make teachers computer illiterate and ineffective even in a digital age. In a study conducted by the scholars on the Psycho-sociological implications of analogue teachers in a digital age, findings revealed that about 84% of teachers in primary, secondary and teacher training institutions are not computer literate, have no computer sets, do not have functional e-mail addresses and do not use the internet for academic researches. In the same vein, Aboderin and Solomon (2014), stated in his study and findings that, in most cases, Nigeria uses incompetent computer teachers in schools thereby creating challenges in the development of technology which could make the nation a digitalized society. This perhaps informs the reason why analogue teachers still dominate primary schools in Nigeria. Teachers need to be abridged with nascent ideas and be developed further in ICT if they must be relevant in their role functions. A teacher who is left behind in the knowledge of the right values needed for effective participation in a contemporary environment, will automatically be socially and psychologically naïve, This calls for concern on how effective teachers in Anambra State public Primary schools are in ICT and whether they have knowledge of and use big data for assessing pupils academic progress.

StaOECD (2008). Assessment for Learning – The Case for Formative Assessment. OECD/CERI International Conference (Online). Accessed on January 30, 2017, from www.oecd.org

Statement of the Problem

The introduction of continuous assessment as an integral part of pupil's academic progress report and as a basis for the assessment and placement of pupils at the primary level of education

Federal Republic of Nigeria (FRN, 2004) makes it mandatory for all teachers to have basic knowledge and skills of computer and information and communication technology (ICT) in general. This becomes so important because continuous assessment is a progressive and consistent comprehensive record of a pupil in all school activities in and out of the classroom situation. It involves records that cover the three domains of learning; the cognitive, affective and the psychomotor domains. The introduction of ICT in schools for data capturing, analysis and processing of information was, perhaps a step taken to ease collection of information, storage and retrieval, especially pupils' continuous assessment. But in a highly digitalized world with much to do with the internet, traditional or localized software may be inadequate to address the complicated needs of the teacher in accessing and retrieving information on the pupils as and when needed due to congestion and slow response to requests

This seems difficult in the developing world and Nigeria in particular, where teachers in the primary sector are not computer friendly; even where they are friendly, they are not very vast in the manipulation of software for desired result.

There is a shared agreement that the current pedagogical culture has failed to support evidence based assessment of learning. This has possibly contributed to the diminishing quality of learning outcomes. The increasing availability of educational data implies that the current methods of assessment are no longer sustainable. . The big data seems to be an alternative approach to this. Big data and data science has been confirmed by researchers to provide opportunities for teachers to generate a lot of data that can be stored and analyzed using new techniques. The data generated by these tools can be used to support learning, teaching and administration. According to Bolohan & Ciobanu (2013), the big data is an extremely large data that requires adequate ICT knowledge and skills to be able to manipulate the process in order to

access, process and analyze necessary information that aids decision making. In other words, a person without the requisite knowledge to manipulate it, cannot make a head way using the big data. But the question is; how many primary school teachers are computer literate and ICT compliant? How many teachers have knowledge of big data ,let alone utilizing data analytics tools to obtain, retrieve and analyze information for school based judgements? It was against this background that this study was embarked upon.

. Purpose of the Study

The focus of this study was to determine primary school teachers' use of ICT and big data for assessment of pupils' academic progress. Specifically, the study was set to determine:

1. If primary school teachers in South East Nigeria have adequate knowledge and use of ICT for assessment of pupils' academic progress report.
2. If primary school teachers have knowledge and techniques of assessment of pupils' academic progress using the big data.

Research Questions

To guide the study the following research questions were raised:

1. To what extent do primary school teachers in South Eastern Nigeria show adequate knowledge and use of ICT for assessment of pupils' academic progress report?
2. What techniques do primary school teachers in South Eastern Nigeria use to assess pupils' academic progress report with the use of Big Data?

Research Hypotheses

The understated hypotheses were formulated and tested at 0.05 alpha level of coefficient significance.

1. Primary school teachers in South Eastern Nigeria have no adequate knowledge and use of ICT for assessment of pupils' academic progress report.
2. Primary school teachers in the South Eastern Nigeria have no knowledge of appropriate techniques for assessment of pupils' academic progress using Big Data.

Method

The study adopted descriptive expo facto design. This was predicted by the nature of the study that bothered on teachers' ICT knowledge and techniques used to assess pupils' academic progress using the big data. Knowledge and techniques can better be described based on the reality on ground without manipulations; hence the justification for the use of this design. The population of the study comprised all public primary school teachers in Anambra State of Nigeria. However, due to the homogenous characteristics of the schools and the teachers, only Anambra state was purposively selected for the study. The sample for the study consisted of 400 teachers' male and female, selected from eight educational zones in the State. The multi stage sampling techniques was first used for the selection. The schools were first grouped into clusters according to Educational Zones and local government areas. From the eight clusters, 50 respondents were selected without specific reference to schools. In collaboration with the Education Secretary's of the Local Government Education Authorities, teachers were randomly selected for the study. An induced one-day seminar/training on ICT was scheduled for the teachers at a selected center. At the seminar venues, the respondents were selected through the random sampling technique. This was done for each of the eight clusters. From the 50 respondents per cluster, 35 were female while 15 were male. This was necessitated by the gap that exists in the enrollment of male and female teachers in favor of female. However, no special attention was given to gender differences in term of the subject matter as all were treated as teachers the researchers. It was a 4 point rating scale

instrument with 21 items. The options were labelled Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). The options were assigned weights thus: VHE =4 points, HE= 3 points, LE=2 points and VLE= 1 point. The instrument was validated by three experts; one each from Computer, Educational Foundations and Educational Psychology Departments. The instrument was vetted for face, content and constructs validity. A trial test was conducted to ensure the reliability of the instrument. The split-half method was adopted. A coefficient value of 0.61 was attained which justified the reliability of the instrument. 400 copies of the instrument were administered to the respondents in scheduled seminar/training programs fixed at different centers of the eight clusters. All the copies were returned dully completed. Data collected were presented in tables. Mean and standard deviation were used for data analysis and interpretation of results. The hypotheses were tested with the use of t-test.

Results

The results of the study were presented as follows:

- 3. Research Question 1:** To what extent do primary school teachers in Anambra State have adequate knowledge and use of ICT for assessment of pupils' academic progress report?

Table 1 :- Frequency and mean distribution of the extent to which primary school teachers show adequate knowledge and use of ICT for assessment of pupils' academic progress report.

S/N	Questionnaire Item	VHE	HE	LE	VLE	X	Std	Decision
1.	I have good knowledge of computer and uses	50	51	127	172	1.95	1.03	LE
2.	I have very shallow knowledge of computer	67	49	175	109	2.19	1.02	LE
3.	Apart from typing and printing, I own and use a computer	61	56	181	102	2.19	0.99	LE
4.	I use computer for computation of pupils' results	20	49	179	152	1.8	0.82	VLE
5.	I use computer to save and retrieve information on my pupils	20	49	179	152	1.84	0.82	VLE
6.	I have the data base of my pupils	20	49	177	154	1.84	0.83	VLE
7.	I analyze information on my pupils with the computer	20	49	174	157	1.83	0.83	VLE
8.	I am ICT compliant	15	54	174	157	1.82	0.80	

9.	ICT facilities are available	20	53	172	155	1.85	0.84	VLE
	Aggregate Mean					1.72		VLE

Table 1 shows that respondents agreed highly with LE and VLE to all the items. It is an indication that the respondents do not have adequate knowledge of ICT and do not regularly use it for assessment of pupils' academic progress as very high percentage of them do not use computer and are not ICT compliant let alone save and retrieved information on pupils from the computer or internet services.

Research Question 2: What techniques do primary school teachers in South Eastern Nigeria use to assess pupils' progress report with the use of Big Data?

Table 2:- Frequency and mean distribution of the techniques primary school teachers use to assess pupils' progress reports with the big data.

S/N	Questionnaire Item	VHE	HE	LE	VLE	X	Std	Decision
	As a teacher, I am not only familiar but also uses the following for assessing pupils' academic progress:							
10.	Algorithm	21	39	187	153	1.82	0.81	VLE

11. Augmented Reality	19	27	201	153	1.78	0.77	VLE	
12. Bring Your Own Device (BYOD).	25	17	191	167	1.75	0.81	VLE	
13. Augmented Books	17	13	195	175	1.68	0.73	VLE	
14. Learning management system	11	21	199	169	1.69	0.70	VLE	
15. NETLOGO	20	17	204	159	1.75	0.76	VLE	
16. Online Games	15	15	264	106	1.85	0.66	VLE	
17. SNAPP.	17	15	109	259	1.48	0.76	VLE	
18. Digital Textbooks.	56	61	107	176	1.99	1.07	VLE	
19. Blended learning	10	14	201	175	1.65	0.67	VLE	
20. Webinars	10	11	204	175	1.64	0.66	VLE	
21. VLE								
Aggregate Mean		10	12	211	167	1.66	0.66	VLE

Table 2 also shows that respondents accepted to VLE with all the items (items 10 to 21). It shows further that almost all the respondents do not have knowledge of the concept of big data let alone being familiar with techniques for assessment of pupils' academic progress with it. They prove not to have idea about the basic terminologies applied in the big data.

Test Hypotheses

The test of the hypotheses was based on response to the items. For ease of computation, the options were grouped as follows; VHE and HE were grouped as HE while LE and VLE were grouped as LE.

Hypothesis 1: Primary school teachers in South Eastern Nigeria have adequate knowledge and use of ICT for assessment of pupils' academic progress report.

Table 3: Test of South East primary school teachers' knowledge and use of ICT for assessment of pupils' academic progress.

Teachers' level of know'	$\sum f$	\bar{x}	SD	Standard error	Df	T-cal.	T-crit.	Decision
HE	747	1.86	-0.64	-5.27	3598	164	4.81	Rejected
LE	2522	7.13	0.81					

In table 3, figures available show that the mean scores for teachers HE and LE knowledge and use of ICT are 1.86 and 7.13 respectively. The standard deviations are -0.64 and 0.81 respectively. The standard error is -5.27, degree of freedom is 3598 while the t-calculated and the t-critical are 164 and 4.81 respectively. The rule guiding the test of null hypothesis using t-test states that; where the t-calculated is greater than the t-critical, the hypothesis should be rejected and the alternative accepted but where the t-calculated is less than the t-critical, it should be accepted. Consequently, hypothesis 1 is rejected and the alternative accepted. It is therefore emphasized that primary school teachers in the South East have no adequate knowledge and use of ICT in assessment of pupils' academic progress.

Hypothesis 2: Primary school teachers in the South Eastern Nigeria have no knowledge of appropriate techniques for assessment of pupils' academic progress with the use of Big Data.

Table 4: Test of South East primary school teaches' knowledge of appropriate techniques for assessment of pupils' and use of ICT for assessment of pupils' academic progress.

Teachers' level of knowl'	$\sum f$	\bar{x}	SD	Standard error	Df	T-Cal.	T-Crit	Decision
VHE	513	1.28	-0.83	-9.71	4908	259.5	9.56	Rejected
LE	4397	10.99	0.94					

Figures in table 4, show the mean scores for teachers VHE and LE knowledge of appropriate techniques for assessment of pupils' academic progress with the use of big data to be 1.28 and 10.99 respectively. The standard deviations are -0.83 and 0.94 respectively. The standard error is -9.71, degree of freedom is 4908 while the t-calculated and the t-critical are 259.5 and 9.56 respectively. Holding on to the established rule for testing null hypothesis using t-test, hypothesis 2 is rejected because the calculated values is significantly greater than the critical value. It is

therefore evident that primary school teachers in Anambra State have no adequate knowledge of the appropriate techniques used for assessment of pupils' academic progress using big data.

Discussion of Results

Results from the study revealed that primary school teachers in Anambra State, South Eastern Nigeria have no basic knowledge and use of computer appliances for the assessment of pupils' academic progress report in spite of the herculean task of managing/assessing very large classes sometimes alone. Findings also showed that majority of the (79%) teachers in primary schools do not own computer systems, not ICT friendly, do not have digital data base of their pupils and do not use the computer to analyze data on pupils' academic activities and progress. It was further revealed that public primary schools lack ICT facilities, hence talking about big data remained a flight of the imagination. These findings align with the findings of Morrison et al (2017) who stated that teacher education in Nigeria does not give practical attention commensurate to the emphasis in the national policy on education of the nation which make teachers computer illiterates and ineffective even in a digital age. When teachers lack the basic knowledge and skills that would make them not to function efficiently and effectively in their role performance, productivity will be low and dissatisfaction will set in.

Further findings in the study also revealed that majority of primary school teachers in Anambra State have little or no knowledge of big data and the basic techniques of assessment using big data. A very high percentage (89.58%) of the respondents indicated that they do not have ideas of big data terminologies such as Algorithms, learning management systems, Bring your own device, Augmented Reality, Virtual classrooms, Online games, Netlogo and many more. This situation makes them incapacitated in the use of big data in the assessment of pupils' academic progress. These findings reflect the position of Bolohan and Ciobanu (2013) who remarked that

the big data is large complex and complicated software that requires special skills to access, process and analyze information for decision making. This might look very vague and meaningless to people who have no good knowledge of the concepts related to big data let alone using it for assessment.

Conclusion

Education is a result-oriented activity that involves basically two parties, the learner and the teacher. The results got from it are usually based on assessment of the activities, especially learner activities based on set criteria. Assessment is a parameter for decision making that leads to placement, selection, certification and reward of the learners; therefore, it should be comprehensive. That is, assessment should cover the three domains of learning-the cognitive, affective and the psychomotor domains. Assessment of learners' academic performance should be objective if dependable and valid decision would be guaranteed. This can only be achieved through continuous assessment. The assessor can only be objective if he/she has adequate knowledge appropriate for the dynamics of learning outcomes. One of such dynamics is the big data.

Nigeria is a developing nation with technological needs. The needs can only be addressed through education; for which teachers are instrumental. No teacher can be effective in role performance, especially in the assessment of pupils' academic performance, which is tantamount to the holistic development of a nation, without adequate knowledge and use of ICT and appropriate techniques for assessing big data. Nigeria primary school teachers generally lack these skills that could make them address many assessment challenges with relative ease. This makes them ineffective, dysfunctional and incomprehensive in pupils' academic progress assessment thereby disadvantaging learners in their future endeavors. This needs immediate attention bearing in mind

the resultant implication on educating children for the future and world of work and now is the time.

Recommendations

Based on the results of the findings, the following recommendations were made;

1. The government of State should provide compulsory computer and ICT training to all serving primary school teachers. This will help to make serving teachers ICT compliant.
2. The concerned States government in collaboration with Local Education Authorities should provide teachers with laptops and other ICT facilities through soft loan. If this is done, every teacher would be mandated to own a computer and would be obliged to learn and use ICT services for assessment of pupil's academic progress.
3. States government concerned should regularly sponsor or organize training and retraining of primary school teachers on big data, the techniques and applications for accessing, storing, retrieving and analyzing data/information with the use of big data. Such training will acquaint primary school teachers with contemporary global practices and standards in education and assessment of pupils' academic progress.
4. Federal and States government should match policy with practical actions by providing schools with the basic facilities that make schools functional in a digital age. This will leave teachers with no option than to key into the global educational trends, especially using the big data for assessing pupils' academic progress and other activities.
5. Teacher Education programmes should be reviewed and modern facilities provided for training of pre-service teachers on best practices in integrating traditional classroom practices and e-learning.

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