American-Eurasian J. Agric. & Environ. Sci., 19 (3): 224-232, 2019
ISSN 1818-6769

DOI: 10.5829/idosi.aejaes.2019.224.232

Big Data and Assessment for Learning in Nigerian Universities: Prospects and Challenges

[1]Christiana A. Ugodulunwa, [2]Charles M. Anikweze, [3]N. Ogba Francisca, [3]Ekechukwu Leona Eucharia, [3]C.N. Igu Ntasiobi, [3]Chidebe Chijioke Uwaleke, [3]Chidiebere K. Duru and [3]Angela Eze

[1]Faculty of Education, Alex Ekwueme Federal University, Ndufu-Alike, Ikwo, Ebonyi State, Nigeria
[2]Faculty of Education, Nasarawa State University, Keffi, Nasarawa State, Nigeria
[3]Faculty of Education Alex-Ekwueme Federal University, Ndufu-Alike, Ikwo, Ebonyi State, Nigeria

Abstract: This study explored perceptions of university teachers on big data and assessment for learning, prospects and challenges of using big data for improving student learning in Nigerian universities. A mixed method approach was adopted for collecting data from a sample of 135 teachers who were drawn using random sampling technique, from 17 universities in Nigeria. A 30-item Big Data Assessment for Learning Scale (B_DALS) was used for collecting quantitative data, while a semi-structured interview schedule was used to collect qualitative data from a sample of 10 deans of faculties and heads of departments, who were not part of the sample of teachers. Quantitative data collected was analysed using percentage, mean and standard deviation descriptive statistical techniques, while themes in the qualitative data were identified and used to corroborate the quantitative data. The findings of the study reveal that less than 50% of the teachers were able to identify different sources of big data that can be used in assessment for learning. The teachers perceived the possibility of using big data for improving teaching and learning (3.88±0.98), reducing students' attrition (3.87±0.98), planning teaching and learning activities (3.58±1.01), improving learning outcomes (3.98±1.02), making adjustments for curriculum improvement (3.85±0.92), as well as using it as basis for teachers' professional development (3.99±1.02) positively. It was also found that the major challenges of using big data in assessment for learning are how to put rich data into useable form to support learning (3.57±1.03), capacity to maintain learning analytics system and design effective intervention (3.62±1.05) and aligning educational data with pedagogically-based action (3.64±0.95). Qualitative interview data provided stories that complemented the findings. Based on the findings, recommendations were made on how to promote use of big data for improving student learning and reducing high rate of withdrawal and probation placement of students in the universities.

Key words: Big Data · Assessment · Student Learning · Prospects · Challenges · University Teachers

INTRODUCTION

Universities in Nigeria operate in a competitive environment and are under pressure to respond to national and global challenges. They continually strive to address the need to increase enrolment in science-related disciplines, embed workplace graduate attributes in curriculum and ensure that quality of learning programmes meets national and global needs. Stakeholders in education expect universities to meet these demands in spite of poor government funding, declining support from private sectors, demand for quality, transparency and accountability, as well as increasing operational cost [1]. The universities cannot effectively and timely respond to the rapid global changes without the use of vast array of data generated but not made available for decision making by administrators [2], hence the need to recourse to big data and analytics.

Corresponding Author: Christiana A. Ugodulunwa, Faculty of Education, Alex Ekwueme Federal University, Ndufu-Alike, Ikwo, Ebonyi State, Nigeria.

Big data is currently being used in business and health care, but it is now emerging in education. Big data refers to data that is too large, complex and dynamic for any conventional data tools to capture, store, manage and analyze [3]. It describes data that is too big and data that moves too fast, that conventional methods of data analysis cannot handle. According to Cope and Kalantzis [4], big data covers innovative techniques and technologies for capturing, storing, distributing, managing and analysing large data sets with different formats. They characterized big data by 6Vs; namely, volume, velocity, veracity, variety, verification and value. Volume refers to large amount of information that is challenging to store, process, analyze and present; while velocity relates to increasing rate at which information flows in an organization. Veracity refers to trust, biases and uncertainty in data; while variety focuses on whether data is structured or unstructured. Verification deals with security of data; while value refers to usefulness of data generated for guiding decision making.

Big data analytics is also an emergent development in education. It is a process of examining large data set for identifying hidden patterns and other necessary information [5]. It is capable of processing structured and unstructured data from different sources. In education sector, big data analytics is divided into two; namely learning analytics (LA) and academic analytics (AA). Learning analytics deals with collection of data about learners and their contexts for improving student learning; while academic analytics is concerned with improving organizational effectiveness through the use of student, academic and institutional data [6]. Assessment for learning is one area in education where big data and learning analytics are found very useful.

Assessment for learning is an assessment that supports learning through continuous monitoring of student learning using feedback to improve performance [7-10]. Assessment for learning is critical for students' mastery of 21st century competencies such as learning how to learn, thinking about own learning, knowing how to plan and evaluate thinking and understanding. According to O'Reilly and Veeramchanet [11], assessment for learning encompasses all activities by teachers and students which provide feedback for modifying teaching and learning activities in the classroom. It is part of everyday practice, where students, teachers and peers seek, reflect and respond to information from assessment tasks to enhance ongoing learning [12], which is different from assessment of learning that is designed primarily to serve the purpose of accountability, grading students' performance and passing judgment on standard of performance. The researchers believe that the emergent of big data and analytics in education is a welcome development that can help universities utilize vast array of data generated, but not used currently for addressing the problem of students' poor performance and attrition in Nigerian universities.

In the context of assessment, big data refers to learner data that is deep and broad [13]. Large amount of data that occurs across many learners in form of test and examination scores can be considered as broad; while data within individual learners, such as, problem-solving processes, misconceptions, background information and other behavioral and contextual information, can be considered as deep. Opara [14] maintain that data-enriched assessment requires that deeper and broader data be collected in order to gain insight into new object of assessment. They argue that big data enriches assessment process through providing continuous diagnostic information on learners' knowledge and related behavior, by promoting learning via targeted feedback that is possible through online learning environments. Through online learning platform, a student's learning process, such as contributions to a discussion forum, learning sessions, steps in problem-solving, interactions with learning resources, peers, or teachers and evidence of concepts and skills that are mastered by students can be continually monitored. Assessment for learning is embedded in the instructional process for supporting teaching and learning, which is very effective when big data analytics is employed. Big data and learning analytics have great promise in online learning environments because meaningful information across and within learners provide a strong basis for assessment for improving students' learning.

Sources of big data in education have been identified in literature. They include demographics, such as age, sex, location and professional background [15, 16], database systems that store large longitudinal data on students, learning activities and teaching [17], students' behavior test and examination results, teaching materials [18], as well as enrollment information and educational needs [19]. Big data can be collected from learning management system (LMS), Blackboard (BB) Learn, Moodle and Massive Open Online Courses (MOOC), among other platforms to enable teachers study and compare several assessment outcomes for all students within class and

across class. The data can be correlated with one another to give insights on individual student's success in online and face-to face situations. This shows that online learning environments have potentials for supporting learning and creating opportunity for novel forms of assessment, such as assessment for learning.

In an online learning platform, big data can provide counts of problems attempted by students, resources accessed and pattern of consultation. It helps teachers to study learners' activities such as problem solving, forum interactions and video watching habits [19]. Furthermore, Carless [3] believe that big data can be measured and analyzed to improve learning and learning environments. We therefore argue that big data can be used to provide targeted feedback and enrich assessment in order to enhance students' learning in universities in Nigeria, since advancement in technology has made it possible to collect and analyze large data sets. However, the relationship between learning analytics and assessment still remain unexplored [6]. It therefore implies that educational institutions in Nigeria need to deploy technological solutions for providing feedback to students and teachers and also need to transform current assessment practices to embrace and integrate learning analytics tools and strategies to support teaching and learning. This transformation therefore demands effective institutional technology infrastructure in universities and teachers understanding of sources of big data and importance of learning analytics.

In education, big data has great promise because of stakeholders increased expectation for accountability and transparency that require implementation of big data to satisfy [7]. Literature shows that big data is useful in the areas of instruction, responsive formative assessment, actively engaged and collaborative learning [9]. The benefits of big data and learning analytics include monitoring students' performance and progress, providing data on instructional interactions, providing longitudinal analysis for predicting students' behavior pattern, identifying students who are at risk and alerting teachers to take appropriate action, as well as helping an institution to improve student retention and academic planning [11]. Availability of big data makes it possible to monitor every student's action, how long it takes them to answer examination questions, sources they use and questions they skip. Answers to these questions can be checked automatically to provide immediate feedback to students through computer-based testing. The implication is that big data can transform education in the areas of students' behavior, assessment, career development and identification of educational needs based on changes in societies. It will also change the way students learn and the way they are taught in higher institutions.

There are volumes of data about learners and teachers, achievements and performance that have not been used for improving learning and teaching [9]. Currently, answers to assignments and examinations are only measurements on performance of students although every student generates big data in the form of personal data, social networks and assessment results, which can be analyzed to obtain optimal learning environment and gain good understanding of students' behavior. In the light of this, Parakh [12] recommend the application of learning analytics for investigating the increasing volume of learner data with the goal of understanding students' activities and behaviors associated with effective learning and using the knowledge to optimize our educational system. Furthermore, [7] stress that it is imperative to use analytics to optimize learning environment in a world that has volumes of data sets, increasing populations of diverse learners, limited budgetary allocation to education, greater focus on quality and accountability. This view is also held by Ramana [16] when they argue that a competitor that fails to develop it capabilities in a big data world will be left behind. The danger of not applying learning analytics was also stressed by Slade and Anirban [1] when they observe that an institution that ignores information that might help to pursue its goals is extremely short-sighted. The ultimate goal of big data in education therefore should be to improve student results. Since educational institutions and society at large need good students, the use of big data in assessment for learning is imperative because it can be used to identify students who are at risks of withdrawal from programmes so that interventions can be given to help them succeed [13].

In spite of the prospects of big data in education, higher institutions of learning have to face some challenges to implement big data and analytics in assessment for learning. Big data has been criticized on issues relating to student privacy, test driven teaching and invasion of teacher accountability regimes. Other challenges include difficulty in accessing required data, developing better understanding of practitioners and gaining their cooperation [5]. Furthermore, there are problems of accuracy of data and timeliness of feedback for learning analytics to function well, conversion of courses that are not delivered completely electronically,

insufficient number of trained personnel to use big data and analytics appropriately and cost of learning analytics software [10]. The challenge of integration of structured and unstructured data from different sources, quality of the data, as well as the cost associated with collecting, storing and developing strategies for data mining was reported by Black and Wiliam [2]. These challenges need to be addressed for big data to be effectively used to reduce potential dropouts and failure in higher institutions of learning.

Big data is a recent development in education. Emergent of research on big data in education a recent development and its goal is to examine how to collect and correlate massive volumes of data in order to identify meaningful behavioral patterns and trends rather than storing them [1]. Many universities are now embracing new class formats and technologies that are designed to meet student needs and reduce operational costs. As universities continue to embrace learning technologies in all facets of their operations and management, variety of data about students and their assessment are generated, which should be used for decision making especially, for reducing poor performance that leads to placement on probation and withdrawal of students.

In Nigeria, many universities have learning management systems for managing student information, teaching, learning and assessment, but the data are not correlated to provide feedback for enhancing students' learning and performance. Research on use of big data for informing teaching and learning in Nigerian universities is scarce, if not completely unavailable. Many students are placed on probation and others are withdrawn at the end of each academic year in Nigerian universities because of poor performance. For instance, Ellis [7] reported in SUN News Online that about 90% of 700 students were rusticated in one federal university in Nigeria as a result of poor performance. Student attrition in many universities in Nigeria is at an unacceptable level and needs to be addressed. We assume that withdrawal of students would have been averted if available data being generated yearly are related to obtain immediate feedback for students and teachers on how they are performing. The feedback usually comes when the students must have been placed on probation or withdrawn. We also believe that deployment of big data and analytics in assessment have potential to help universities in Nigeria identify and evaluate strategies that can improve retention. It is therefore necessary that data warehouse should be built as a central repository of data or centralized database that can be leveraged for better decision making. This is important because recent developments in database technologies make collection and maintenance of data from multiple sources and of different structure feasible to analyze and be used for monitoring students' learning progress.

There is dearth of research into big data in universities institutions in Nigeria, particularly in relation to assessment for learning. Despite the growing interests in exploring the value of data within higher education, volume and variety of research in the area still remain scanty. There is therefore need to investigate perceptions of teachers on their understanding of big data sources, prospects and challenges. This is necessary because use of big data in assessment for learning is an effective procedure for improving teaching and learning, which will help reduce high withdrawal and probation placement of students in the universities. This paper is significant because of its contribution to understanding of big data and analytics in relation to assessment for learning in universities in Nigeria. This paper therefore explored the perceptions of university teachers on sources of big data for assessment, prospects and challenges associated with big data for implementing assessment for learning in Nigerian Universities. To achieve the purpose of the study, the following questions were raised: 1.What are the sources of big data for assessment for learning, as perceived by university teachers in Nigeria? 2. What are the prospects of using big data in assessment for learning as perceived by university teachers in Nigeria? 3. What are the challenges facing universities in Nigeria in the use of big data in assessment for learning?

MATERIAL AND METHODS

A mixed method approach was adopted for collecting data from a sample of 134 university lecturers/teachers who attended at annual international conference on promoting excellence in teaching and learning in higher education held at Alex Ekwueme Federal University, Ndufu- Alike Ikwo, Ebonyi State, Nigeria in April 2018. The participants came from 17 universities (10 Federal universities and 7 State universities) in five out of the six geo-political zones in Nigeria. The zones are South-West, South-South, South-East, North-Central and North-East Nigeria. The sample consisted of 134 university teachers (84 male; 50 female). Fifty four of the teachers are senior academic staff; while 80 are in the junior cadre. Forty seven of the teachers are in the

science-based disciplines, 53 in Arts and 34 in Social Science-based disciplines. The sample was drawn using simple random sampling technique. A 34-item Big Data Assessment for Learning Scale (B_DALS),developed and validated by the researchers, was used for collecting quantitative data, while a semi-structured interview schedule was used to collect qualitative data from10 teachers who hold administrative positions as either Dean of Faculty or Head of Departments, who were not participants at the conference.

The 34 items that were organized in three sections, A, B and C. Section A sought information on teachers' type of institution, faculty, gender and academic rank. Section B consists of one item that required the teachers to check perceived sources of big data in their universities; while section C consists of 29 items on prospects and challenges of using big data in assessment for learning. The items elicited responses on a 5-point Likert scale; Strongly Agree (5), Agree (4), Undecided (3), Disagree (2) and Strongly Disagree (1) for positive items; while the scoring was reversed for negative items (that is, 1, 2, 3, 4 and 5 for strongly agree, agree, undecided, disagree and strongly disagree, respectively). A cut-off score 3.50, which is the midpoint between agreement and undecided was used for taking decision about items that were perceived by teachers as prospects and challenges and those that were not.

The instrument was subjected to the scrutiny of two experts in educational measurement and evaluation to judge appropriateness and clarity of the items. The items were considered adequate for assessment of university teachers' perception of prospects and challenges of the use of big data in assessment for learning. The B_DALS was administered directly to the teachers within the 4 days of conference duration by the researchers. The Cronbach coefficient alpha obtained for the 20 items on prospect was 0.78; while coefficient alpha for 9 items on challenges of the use of big data in assessment for learning was 0.75. The instrument was therefore considered to be a reliable measure of university teachers' perception of prospects and challenges of using big data in assessment for learning in the universities in Nigeria. A semi-structured interview schedule was also designed and used to collect qualitative data from10 teachers on sources of big data in education that are relevant for use in assessment for learning, as well as prospects and challenges of big data use in assessment for learning.

The quantitative data collected for profiling teachers' perception of prospects and challenges of big data in assessment for learning were analyzed using percentages, mean and standard deviation; while themes in the qualitative data were identified and used to corroborate the quantitative data. The results of the analyses are presented in Tables 1 to 3.

RESULTS

Table 1 shows that percentage of teachers' responses on perceived sources of big data that can be utilized in assessment for learning ranged from 22.1% to 69.4%. The results of data analysis reveal that the only source of big data that can be used for assessment for learning endorsed by more than 50% the university teachers was students' enrolment data; while the other big data sources received less than 50% endorsement. This implies that majority (69.4%) of the teachers identified students' enrolment data as source of big data for assessment; less than 50% of them endorsed student academic background, disciplinary record, demographic characteristics, grades, online social interactions and online discussion forum. Others are data collected from employers/industries, unstructured data such as documents, emails and video. The standard

Table 1: Perceived Sources of Big Data in Assessment for Learning by the University Teachers

		Yes		No		Total	
S/n Source	n=(134)	f	%	f	%	f	%
1.	Students' enrolment data	93	69.4*	41	30.6	134	100
2.	Students' academic background	64	47.8	70	52.2	134	100
3.	Students' Disciplinary record	30	22.4	104	77.6	134	100
4.	Students' demographic characteristics	57	42.5	77	57.5	134	100
5.	Components of students' grades	58	43.3	76	56.7	134	100
6.	Online social interactions	46	34.3	88	65.7	134	100
7.	Online discussion forum	33	24.6	101	75.4	134	100
8.	Unstructured data type such as documents,video, audio, etc.	32	23.9	102	76.1	134	100
9.	Data collected from employers/industries	45	33.6	89	66.4	134	100
10.	Unstructured content from email, office documents, etc	37	27.6	97	72.4	134	100

Note: *%≥ 50

Table 2: Mean and Standard Deviation of Teachers' Perceived Prospects of using Big Data in Assessment for Learning

S/n	Prospect(n=134)	n	Mean	SD
1.	Big data can be used for improving student learning	123	3.20	1.39
2.	Big data can be used for monitoring student learning	122	3.28	1.24
3.	There is big data initiative underway in Nigerian universities	121	2.73	1.31
4.	Big data will guide teachers in improving teaching and learning	127	3.88*	1.11
5.	Use of big data will help address students' needs to reduce attrition	124	3.87*	0.98
6.	Big data can be used for planning teaching and learning activities	126	3.58*	1.08
7.	Big data can be used for providing timely feedback	121	3.42	1.11
8.	Big data can be used for academic planning in Nigerian universities	125	3.59*	1.01
9.	Big data can be used for resource allocation in Nigerian universities	125	3.63*	1.04
10.	Big data is beneficial for improving student learning outcomes	117	3.98*	1.02
11.	Big data form basis for teachers' professional development	123	3.99*	0.99
12.	Big data is useful for strategic planning to ensure that curriculum targets students' needs	128	4.00*	0.93
13.	My university has powerful information technology system	124	3.46	1.14
14.	Big data allows teachers to make adjustments for curriculum Improvement	127	3.85*	0.92
15.	Nigerian universities have big data analytics software	130	3.16	1.11
16.	Nigerian universities have big data quality assessment framework in her strategic plan	125	3.26	1.01
17.	My university is committed to developing sophisticated IT infrastructure	131	3.68*	0.99
18.	Nigerian universities have strong culture of data-informed Decision-making	130	3.67*	0.94

Note: *Mean perception $\geq$ 3.5

Table 3. Mean and Standard Deviation of Teachers' Perceived Challenges of using Big Data in Assessment for Learning

S/n	Challenge	n	Mean	SD
1.	Lack of big data analytics infrastructure	130	3.16	1.20
2.	Non-utilization of big data for decision making	119	2.94	1.32
3.	Lack of training opportunities on use of big data for assessment	129	3.05	1.22
4.	Non-availability of big data quality assessment framework	125	3.08	1.22
5.	Issues of invasion of privacy in handling students' personal data	131	3.27	1.20
6.	Difficulty in measuring outcomes such as employability and Critical thinking	129	3.29	1.09
7.	How to put rich data into useable form to support learning	128	3.57*	1.03
8.	Difficulty in handling variety of big data sources	129	3.40	1.06
9.	Capacity to maintain learning analytics system and design effective intervention	128	3.62*	1.05
10.	Aligning educational data with pedagogically-based plan action	129	3.64*	0.95

Note: *Mean perception score $\geq$ 3.5

deviations reveal that the teachers were unanimous in their perceptions. It can therefore be deduced from the data that many university teachers are not aware of different sources of big data that can be used in assessment for learning.

Table 2 reveals mean and standard deviation of university teachers' responses on perceived prospects of use of big data and analytics in assessment for learning. The mid-point of 3.50 between agreement and undecided on the response scale was used as criterion for determining teachers' perception on prospects of use of big data in assessment for learning. The mean responses ranged from 2.73 to 4.00; while the standard deviation ranged from 0.92 to 1.39. The teachers perceived the possibility of using big data for improving teaching and learning (3.88±0.98), reducing students' attrition (3.87±0.98), planning teaching and learning activities (3.58±1.01), improving learning outcomes (3.98±1.02), making adjustments for curriculum improvement (3.85±0.92), as well as using it as basis for teachers' professional development (3.99±1.02) positively. The teachers also endorsed positively the possibility of using big data for the following administrative functions: academic planning (3.59±1.01), resource allocation (3.63±1.04), strategic planning to ensure that curriculum targets students' needs (4.00±0.90), universities' commitment to developing IT infrastructure (3.68±0.99) and having strong culture of data-informed decision making (3.67±0.94). The standard deviations reveal that the teachers were unanimous in their perceptions.

One central theme in the qualitative data collected through interview is that big data has great prospects in assessment for learning and education, for record keeping and use in decision-making, as shown in the following extract from one of the interview transcripts:

> "Good prospects. Yes, great prospects, records are now available. Documents are being converted into soft copies in universities. There is no alternative because big data will help us to get information about students and help in decision-making….."

It can be deduced from the results that the teachers have positive perception on the possibility of using big data in assessment for improving teaching and learning and for data-driven administrative decision making in the areas of IT infrastructure, strategic and academic planning, as well as resource allocation in Nigerian Universities.

Table 3 shows that the mean responses of the teachers ranged from 2.92 to 3.64 and standard deviation ranged from 0.95 to 1.32 for the identified challenges of big data in assessment for learning. The standard deviations reveal that the teachers were unanimous in their perceptions. The Table also shows that the major challenges of using big data in assessment for learning are how to put rich data into useable form to support learning (3.57±1.03), capacity to maintain learning analytics system and design effective intervention (3.62±1.05) and aligning educational data with pedagogically-based action (3.64±0.95). Qualitative interview data provided stories that will complement quantitative analyses. One central theme in the stories is that most of the interviewees indicated that use of big data in assessment faces the challenge of technological infrastructure and learning analytics software as well as lack of necessary competence for handling big data in education. This is evident in the following extract from one of the interview transcripts:

> "The only decision universities use big data for is certification. This is not good enough because people's skills are not used for decision-making**.** Technology has not gone far, we still battle with conventional ones because of lack of software and technology that will help mine the data for analysis and use….."

The Table also reveals that the teachers did not perceive the following as challenges of big data in assessment for learning; lack of data analytics infrastructure, non-use of big data for decision making, lack of training opportunities on use of big data, non-availability of big data quality framework, issues of invasion of privacy in handling students' personal data, difficulty in measuring outcomes such as employability and critical thinking, as well as difficulty in handling variety of big data sources.

DISCUSSION

This study explored perceptions of university teachers on sources of big data for assessment, prospects and challenges associated with big data for implementing assessment for learning in Nigerian universities. The finding from the quantitative data shows that university teachers are not aware of different sources of big data that can be used in assessment for learning, such as student academic background information, disciplinary record, demographic characteristics, grades, online social interactions and online discussion forum, as well as unstructured data such as documents, emails and video that enable teachers get insight into students' learning and performance. This finding corroborates the views of Macfadyen *et al*. [9] that vast data generated in education are not used for decision making. If big data is used effectively for decision making, teachers would be aware of different sources of big data that are broad and deep. The finding therefore suggests that learner data that is deep and broad are not used to support students' learning. It is important that big data and learning analytics be adopted in Nigerian universities for providing real time feedback for students and teachers as well as opportunities for them to act on the feedback [4].

The second finding was that the teachers have positive perception on the possibility of using big data in assessment for improving teaching and learning and for data-driven administrative decision making in the areas of IT infrastructure, strategic and academic planning, as well as resource allocation in Nigerian Universities. This corroborates [14] view that big data is useful for responsive formative assessment and that of Thille *et al*. [17] that big data and learning analytics can be beneficial for monitoring students' progress and predicting student' behavior pattern, as well as identifying students who are at risk and helping institutions to improve student retention and academic planning. The finding is also supported by the Slade and Prinsloo [15] view that big data provides opportunities for knowledge flow and learning success, improved learning through self-assessment of students and teachers, as well as reduction in risks of students' dropout. The finding implies that big data and learning analytics have the great prospect in assessment for leaning that is embedded in teaching and learning process. This is expected because of the concern being expressed by management and staff of universities in Nigeria over the increased number of students placed on probation or rusticated from universities because of poor performance. Availability of big data and learning management systems in the universities as well as development of IT infrastructure therefore makes it possible to monitor every student's action, how long it takes them to answer examination

questions, sources they use and questions they skip, among others. Answers to these questions can be checked automatically to provide immediate feedback to students through computer-based testing. Furthermore, availability of student background information data and IT development, ICT use by students and staff make the use of big data and learning analytics in assessment for learning feasible.

The finding that the challenges of using big data in assessment for learning include how to put rich data into useable form to support learning, capacity to maintain learning analytics system and design effective intervention, as well as aligning educational data with pedagogically-based action agrees with the findings of Manyika *et al*.[10] who identified difficulty in accessing required data from poorly integrated database system, poor understanding of practitioners and difficulty in winning their cooperation as major challenge in using big data in education. This implies that any effort to transform assessment practices to embrace and integrate big data and learning analytics to support teaching and learning requires effective institutional technology infrastructures [12], capacity building and attitudinal change among the stakeholders. It is therefore necessary that policies should be put in place for use of big data for assessment that supports learning, since policies are critical driving forces for change in institutions and organisations. We therefore argue that use of big data in assessment for learning can be implemented in Nigerian universities if new policies are put in place to enforce it and if it is captured in universities strategic plans.

The emerging theme in the stories is the concern expressed by teachers about lack of learning analytics and competence in handling big data, limited IT infrastructure for data mining, corruption and non-utilization of data analysis results for decision making. This excerpt from interview transcript provides evidence for this assertion:

> "Actually data analysis and use, even the analysis results are not used. Corruption is part of the reasons for not using big data. The only decision universities use big data for is certification. Technology has not gone far. We still battle with conventional ones; lack of competence in handling big data….."

These factors are likely to affect systematic use of big data to provide feedback for supporting teaching and learning. In a situation where use of feedback is weak and not tied to specific action to close existing gaps, the benefits of assessment for learning or formative assessment cannot be achieved in any educational assessment practice. Thus, it is important to take these factors into account when implementing use of big data and assessment for learning in universities.

The researchers are aware of some limitations of this study. However, to fully understand the perceptions of university teachers in Nigeria on big data use in assessment for learning, there is need to increase the sample size and include observation in the study in addition to extending the area of study in future research. Nonetheless, the study has provided useful insights into the teachers' understanding of big data, possibilities of using it in education at the university level and the challenges to be overcome. It has also provided baseline data for building capacity of teachers and management staff in the universities on the need to utilise big data in assessment for enhancing students' learning and reducing dropout rate.

Recommendation/Implications of the Study: The following recommendations are made based on the findings of the study:

- Assessment practices should be transformed to embrace big data and integrate learning analytics tools and strategies to support teaching and learning through effective institutional technology infrastructures and learning management systems.
- Assessment policies should be developed by the National Universities Commission (NUC) should include big data and assessment for learning to drive the use of big data in education.
- Learning analytics experts should be employed and/or capacities of available IT staff need to be developed through training to enable them provide feedback from big data that is needed by the university management, teachers and students for improving performance. The training will help them develop good understanding of how to analyze and use big data to provide feedback that will support learning.

CONCLUSION

The study explored university teachers' perceptions on big data sources that can be used in assessment for learning, prospects and challenges of big data in supporting teaching and learning. The findings of the study show that many of the university could not identify different sources of big data that can be used in assessment for learning. It was found that the teachers have positive perception on the prospects of using big data in assessment that improves teaching and learning

and data driven administrative decision making. The major challenges identified include how to use available big data for assessment that supports teaching and learning, IT infrastructures and capacity to maintain learning analytics system and design effective intervention. In spite of the challenges, big data and analytics can provide feedback fot improving teaching and learning, thereby reduce potential dropouts and failure. All these are possible through effective development and use of big data and analytics in the universities. The dominant use of assessment results for certification in universities and nonuse of volumes of data accumulated yearly suggest the need for developing strong IT infrastructure, effective and efficient learning management systems, policies and engaging learning analytics, as well as capacity building for the teachers. The study has therefore made useful contribution by providing empirical evidence that can be used as baseline for conducting further research on big data and assessment for learning.

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