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

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Abstract

This study explored the perceptions of university teachers on sources of big data for assessment, and evaluated the prospects and challenges of using big data in assessment for learning in Nigerian universities. A mixed method approach was adopted for collecting data from a random sample of 134 university teachers in Nigeria. A 30-item Big Data Assessment for Learning Scale (B_DALS) and a semi-structured interview schedule were used for data collection. Quantitative data collected was analysed using descriptive statistical techniques, while themes in the qualitative data were identified and used to corroborate the quantitative data. The findings 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 positively, 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), among others. It was also found that major challenges of using big data in assessment for learning are; how to put rich data into usable 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). It was concluded that big data should be used in assessment for learning to reduce high rate of withdrawal and probation placement of students in Nigerian universities.

Keywords: big data, analytics, prospects, challenges, assessment, learning, university teachers

Introduction

Big data refers to data that is so large, complex and dynamic that any conventional data tools cannot capture, store, manage and analyse. It describes data that is very big and moves too fast, that conventional methods of data analysis cannot handle (Ramana, n.d). According to Manyika, et al. (2011), big data requires innovative techniques and technologies for capturing, storing, distributing, managing and analysing large data sets with different formats. Big data in education cannot be utilised in assessment for learning without big data analytics. Data analytics is conceptualized as a process of examining large data set, both structured and unstructured, for identifying hidden patterns and other necessary information (Anirban, 2014). In the education sector, big data analytics is divided into 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 organisational effectiveness through the use of student, academic, and institutional data (Daniel, 2014). Assessment for learning is one area in education where big data and learning analytics are very useful. It is an assessment that supports learning through continuous monitoring of student learning using feedback to improve performance (Black & Wiliam, 1998).

In the context of assessment, big data refers to learner data that is deep and broad (Thille, et al., 2014). Examples of broad data are test and examination scores; while data within individual learners, such as, background, behavioural and contextual information are deep data. Big data enriches assessment process by providing continuous diagnostic information on learners' knowledge and related behaviour, and promoting learning via targeted feedback. This implies that online learning platform is required, where 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, can be continually monitored. Big data and learning analytics therefore have great promise in online learning environments because meaningful information across and within learners provide a strong basis for assessment for improving students' learning.

The usefulness of big data and learning analytics in the areas of instruction, responsive formative assessment, actively engaged and collaborative learning has been stressed in literature (Cope & Kalantzis, 2016). The benefits include monitoring students' performance and progress, providing data on instructional interactions, providing longitudinal analysis for predicting students' behaviour pattern, identifying students at risk and alerting teachers to take appropriate action, as well as helping institutions to improve student retention and academic planning (Picciano, 2014; Macfadyen, Dawson, Pardo, & Gasevi, 2014). In spite of the prospects of big

data in higher education, it has been criticized on issues relating to student's privacy, difficulty in accessing required data, and problem of gaining their cooperation (Anirban, 2014). Other problems are accuracy of data and timeliness of feedback, conversion of courses that are not delivered electronically, insufficient number of trained personnel to use big data and analytics, integration of structured and unstructured data from different sources, and cost of learning analytics software (Picciano, 2014; Daniel, 2014).

Emergence of research on big data in education is a recent development and its goal is to examine how to collect and correlate massive volumes of data in order to identify meaningful behavioural patterns and trends rather than storing them (Daniel, 2014). 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.

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 analysed to obtain optimal learning environment and gain good understanding of students' behaviour. Research on use of big data for informing teaching and learning in Nigerian universities is therefore scarce, if not completely unavailable. Many students are placed on probation and others are withdrawn at the end of each academic year from Nigerian universities because of poor performance. For instance, Opara (2017) reported in the Punch Newspaper that majority of the 700 students rusticated from one federal university in Nigeria in 2015/2016 academic session was as a result of poor performance. Student attrition in many universities in Nigeria is at an unacceptable level and needs to be addressed. It is therefore assumed that withdrawal of students would be averted if available data

being generated yearly are correlated to obtain immediate feedback for students and teachers on how they are performing. The feedback usually comes late after the students must have been placed on probation or withdrawn.

This paper therefore explored the perceptions of university teachers on sources of big data for assessment, prospects and challenges associated with using big data for implementing assessment for learning in Nigerian Universities. To achieve this purpose, the following questions were raised: 1.What are the big data sources required in assessment for learning? 2. What are the prospects of using big data in assessment for learning? 3. What are the challenges facing Nigerian universities in using big data in assessment for learning?

Method

A mixed method approach was adopted for collecting data from a random sample of 134 university teachers who attended an annual international conference on Promoting Excellence in Teaching and Learning in Higher Education at Alex Ekwueme Federal University, Ndufu- Alike Ikwo, Ebonyi State, Nigeria in April, 2018. The participants came from 17 universities (10 Federal; 7 State) in five geo-political zones in Nigeria. The sample consisted of 84 male and 50 female teachers (54 senior; 80 junior academic staff) in different disciplines (47 science-; 53 Arts-; 34 Social Science-based).

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 from 10 teachers who hold administrative positions.

The 34 items were organized in three sections. Section A sought teachers' background information, Section B required teachers to check big data sources in their universities; while

section C comprised items on prospects and challenges of 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. 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 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 prospects 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 quantitative data were analysed 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.

Result and Discussion

Table 1: Teachers' Perceived Sources of Big Data in Assessment for Learning (AfL)

S/N	**Description of Items**	**Yes**		**No**		**Total**	
		f	**%**	**F**	**%**	**f**	**%**
1.	Students' enrolment data	93	69.4	41	30.6	134	100
2.	Students' academic background	84	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	76	56.7	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 1 reveals that the only source of big data that can be used in assessment for learning endorsed by more than 50% of the university teachers was students' enrolment data; while the other big data sources received less than 50% endorsement. The results show that many university teachers are unaware of different sources of big data that can be used in assessment for learning. This finding corroborates the views of Daniel (2014) that vast data generated in education are not used for decision making. 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 to act on it.

Table 2: Mean and Standard Deviation of Teachers' Perceived Prospects of Big Data in AfL

S/n	Prospect (n=134)	n	Mean	SD
Big data is useful for…..				
1.	improving student learning	123	3.20	1.39
2.	monitoring student learning	122	3.28	1.24
3.	planning teaching and learning activities	126	3.58*	1.08
4.	providing timely feedback	121	3.42	1.11
5.	academic planning	125	3.59*	1.01
6.	resource allocation	125	3.63*	1.04
7.	guiding teachers to improve teaching and learning	127	3.88*	1.11
8.	addressing students' needs to reduce attrition	124	3.87*	0.98
9.	improving student learning outcomes	117	3.98*	1.02
10.	strategic planning to ensure that curriculum targets students' needs	128	4.00*	0.93
11.	making adjustments for curriculum improvement	127	3.85*	0.92
12.	Big data initiative is underway in Nigerian universities	121	2.73	1.31
13.	Big data forms basis for teachers' professional development	123	3.99*	0.99
14.	My university has powerful information technology system	124	3.46	1.14
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≥3.5

Table 2 shows mean and standard deviation of university teachers' responses on perceived prospects 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 perception on prospects 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 endorsed positively, 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), among others. They also endorsed administrative uses of big data for 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, 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….."

This finding corroborates Cope and Kalantzis (2016) view that big data is useful for responsive formative assessment and that of Picciano (2014) that big data and learning analytics are beneficial for monitoring students' progress, predicting student' behaviour pattern, identifying

students who are at risk, and helping institutions to improve student retention and academic planning. The finding also agrees with Anirban's (2016) views 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 prospects in assessment for learning.

Table 3: Mean and Standard Deviation of Teachers' Perceived Challenges of using Big Data in AfL

S/N	Description of Items	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 ≥ 3.5

Table 3 shows that the major challenges of using big data in assessment for learning are how to put rich data into usable 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). The central theme in the qualitative data is 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 agrees with the findings of Anirban (2016) who identified difficulty in accessing required data from poorly integrated database system as major challenge in using big data in education. It

suggests 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 (Macfadyen, et al., 2014). The following recommendations are therefore made based on the findings of the study:

1. 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.
2. Assessment policies should be developed by the National Universities Commission (NUC) of Nigeria to include big data and assessment for learning to drive the use of big data in education.
3. Learning analytics experts should be employed and capacities of available IT staff built to enable them provide feedback from big data needed by the university management, teachers and students for improving performance.

Conclusion

The study examined university teachers' perceptions on big data sources that can be used in assessment for learning, its prospects and challenges. The findings of the study show that many university teachers are unaware of big data sources. However, they perceive big data as having great prospects in assessment for learning in spite of different challenges. It is therefore concluded that big data and analytics can provide feedback for improving teaching and learning, as well as reduce potential dropouts and failure, with effective development and deployment of big data and analytics in the universities.

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