

THEME: Innovations for Quality Education and Lifelong Learning
SUB-THEME: Technology
TOPIC: Learning Analytics: Analysing Trends in online learning activities for Masters' Students at Botswana Open University (BOU)

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Abstract

As institutions of higher learning promote support, success and completion rate for their students, learning analytics has attracted attention as a process of providing data that could inform institutional processes on diversity of learning needs and student success. Botswana Open University (BOU) has online systems that generate a lot of student data, which has not been analysed. The purpose of the study was to investigate how Learning Analytics could be used to assist programme coordinators, tutors and support services to enhance teaching and learning at BOU

The problem was that despite the institution having this vast amount of data, there has been no research undertaken to explore the potential benefits of utilising this data to enhance teaching and learning at BOU. The study examines students' interaction data with Moodle platform during the course of their studies. The study adopted a quantitative approach with data extracted from the system. SPSS was used to analyse the data to inform generalised conclusions. The research sample was based on graduate students from the Master of Education (Educational Leadership) programme offered at the School of Education. Purposive sampling was preferred to include all enrolled 175 students from 2014 to 2017 for purposes of comparison.

The results indicated that most students used the online platform mainly to access announcements. They also used the system to access course content, Learning Journals, Library Resources, Assignment submission and delivery schedules. The findings revealed that student support activities could be designed to capitalise on increasing online posting of student support information online, providing more course content related support to students online and also sharing of research material such as journals.

Keywords: Learning Analytics (LA); Botswana Open University (BOU); Learner Management System (LMS), Moodle Platform

Introduction

Despite Learning Analytics (LA) being increasingly applied in a wide range of educational organizations, the literature in this area has usually focused on conventional face-to-face institution (Wong (2017, p 21). Wong (2017) argues that open and distance learning institutions present an ideal context for the use of learning analytics because they usually have large student population who are increasingly, being supported by the use of Internet, learning management systems (LMS) and mobile technologies resulting in the creation of data that can be analysed. Firat and Yuzer, (2016) concur with this view that in the ODL context there is yet to be a systematic review summarizing existing work on the potential benefits of LA. This creates a knowledge gap that this study will contribute towards.

This paper examines research involving LA and its potential value to Botswana Open University (BOU) student support processes as an open and distance learning (ODL) institution. The focus would be on data generated on one ICT mediated programme offered in the School of Education namely, Masters in Education- Educational Leadership (MEDEL) from 2014 to 2018). The paper further highlights the benefits and challenges derived from the data accumulated from the Moodle platform. This would be mined and analysed to assess how it could benefit both the university and the students.

Learning Analytics as used in this paper is focused on the student, gathering data from course management and student information systems in order to observe student interaction with a view to manage and improve student success. The study attempts to discover how the necessary interventions could be developed. Thus learning analytics is perceived as focusing on the students and their behaviours. Through this paper it would be established how the data could inform practice in the MEDEL programme of study and be extended to the other programmes of the university.

Literature Review

An increasingly large number of tertiary educational institutions are moving toward online programme offering in the process producing large quantities of data. It has been observed that in distance education a high proportion of interactions occur in computer mediated environments (Elias, 2011). Unprecedented amount of data surrounding these interactions is becoming available. Learners and teachers leave many traces behind them in which Learning Analytics can convert them to be beneficial for the education sector (Duval, 2011). In an Educational institution context, it is argued that LA involves the use of big data analysis as a means of providing insights and improvement to performance in institution's educational delivery. It has been observed that ODL institutions tend to move more towards the use of Internet and mobile technologies and as result produce a substantial amount of data that could require learning analysis (LA). Research reveals that such data could be used to inform decisions on the nature of financial and pedagogical resources needed to improve educational outcomes (Educause, 2010). There are several factors driving the emergence expansion of Learning Analytics. These factors are: a) The boundlessness and the proliferation of internet and technology among all educational categories. b) The large abundance of data available from learning environments. c) The availability of tools that can be used to manage and analyze data. d) The increasing demand to understand learners and improve the learning environment and its context.

Literature reveals that despite the range of data available and its ability to inform a diversity of end users, there has been limited application of this data within higher education (Dawson, Heathcote & Poole, 2010). Making a point in this regard Elias, (2011) concurs that despite the availability of such data, educators often lack the specific information they need to identify important academic performance issues. Consequently, in most higher education institution, the development of actionable knowledge related to teaching and learning more often than not remain unused at data level in a meaningless form (Norris, 2008).

Learning Management Systems (LMS) generate a lot of personal, administrative and academic information on both students and staff as they interact with the system on a regular basis. In the quest to improve student performance and quality of graduates, higher education institutions need to develop interest in accessing this vast amounts of data and analysing it to extract value that can be utilised towards improving teaching and learning. Firat and Yuzer (2016) argue that the e-learning environment supported by fast growing internet technologies actually provided education researchers with new opportunities to follow and evaluate traces left by learners, and possibly other users, on the systems used to establish trends. This presented an opportunity for appearance of new research fields such as

Learning Analytics. Learning Analytics is a fast growing area of research in the field of online education and Technology Enhanced Learning (TEL) (Khalil and Ebner, 2015). Brown (2012) is of the view that LA is aimed at reaching better student learning success using data and statistical analysis methods.

Learning Analytics has been defined variably by a number of different authors. Some scholars define learning analytics as a multidisciplinary field involving machine knowledge learning, artificial intelligence, information retrieval, statistics and visualisation (Chatti, Dyckhoff, Schroeder and Thus, 2012, p1). According to Firat and Yuzer (2016), ‘learning analytics is defined as field aiming to access trends or structures via big data or datasets in education related to students in order to move the supportive and customised higher education system forward.’ However, the Society for Learning Analytics Research (SoLAR, 2011) defines LA as “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environment in which it occurs.” However, Siemens (2010) defines LA as “the use of intelligent data, learner product data and analysis models to discover information and social connections to predict and advice learning.” Some scholars define learning analytics as “a multidisciplinary field involving machine knowledge learning, artificial intelligence, information retrieval, statistics and visualization” (Chatti, Dyckhoff, Schroeder and Thus, 2012, p1). Additionally, Campbell and Oblinger, (2007) cited by Billy Tak Wong (2016) defined LA as the process of collecting, evaluating analysing and reporting organizational data for decision making. LA is perceived as iterative cycle process with three major steps:

I. Data collection and pre-processing

It involves the collection of data from various educational environments and systems. Through this process useful patterns are established from the data. Data pre- processing allows for synthesis of information to create data suitable usage.(data cleaning, data integration, data transformation, data reduction, data modeling, user and session identification, and path completion (Han and Kamber, 2006, Liu, 2006; Romero& Venture, 2007)

II. Analytic and action

Applying different LA techniques to data to explore the data in order to discover hidden patterns that can help provide a more effective learning experience. Actions entailed may include monitoring, analysis, prediction, intervention, assessment, adaptation, personalization, recommendation and reflection.

III. Post processing

Involves compiling new data from additional data sources, refining the data set, determining new attributes required from the new iteration, identifying new indicators/ metrics modifying the variables of analysis, or choosing a new analytics method.

Definition of Learning Analytics

For the purpose of this study, the SoLAR definition was adopted as this is the definition adopted by the University in its Learning Analytics Policy, Strategy and Implementation Plan. This was to ensure that the research is contextualised to the teaching and learning environment and the LA guiding tools of the Botswana Open University.

Conceptual Framework

This study adopted Baker’s (2007) depiction of knowledge Continuum to situate the study. In this framework raw data is at the lowest end of / bottom of the continuum, consisting of characters, symbols and other input that, on its own, is meaningless. However, as meaning is attached to data, it transforms into information, that could be used to answer the questions of who, what, when and where. Through analysis and synthesis that information becomes knowledge capable of answering the questions of why and how. Ultimately, that knowledge is transformed into wisdom through its application. In the framework Baker, argued that the predictive analytics and the development of actionable knowledge correspond with the transformation of knowledge to wisdom. The knowledge continuum highlights that it is in the processing and use of data that it is transformed into something meaningful. (Elias, 2011, p6).

Methodology

This study aims to investigate student interaction patterns with online activities and support services provided in the Moodle LMS platform. It has adopted a quantitative approach comparative case study

of MEDL students across a five-year period commencing 2014 to 2018. The data used for this study were harvested from the university LMS platform hence a quantitative approach was used to analyse the data. A purposive sampling approach was used to identify in identifying the study population as it was the only technology mediated programme in the university. The populations of Active students in the LMS in 2015 were 70; 2016 active students were 100; in 2017 active students were 70; while in 2018 there were 59 active students.

In the context of open and distance education it is sometimes difficult to identify students in need of support in a specific course. Therefore, since analytics are able to draw on information about online learning activity in order to support teachers and guide students. The data used in this study was mined from the BOU LMS platform for analysis as this is the environment within which learning is taking place. The main variables that were considered for data collection were:

1. Participation on chats and forums,
2. Observations on entry visits to announcement; course material and resources
3. Analysis of MEDEL grades

Results

The programme data was extracted from the Moodle LMS according to the six (6) individual year 1 semester 1 courses delivered in each of the 4 years. This was done to enable the researchers to examine the student behaviour patterns emerging from their interaction with the platform across the years starting from 2014 till 2017. The results were presented in Tables 1 – 7 and the corresponding Diagrams 1 – 7 below:

Table 1: Programme Overview

	2014	2015	2016	2017
News and Announcements	85	72	75	64
Learning Journals	41	54	60	70
Library Online Resources	38	50	59	66
Chats	68	50	50	48

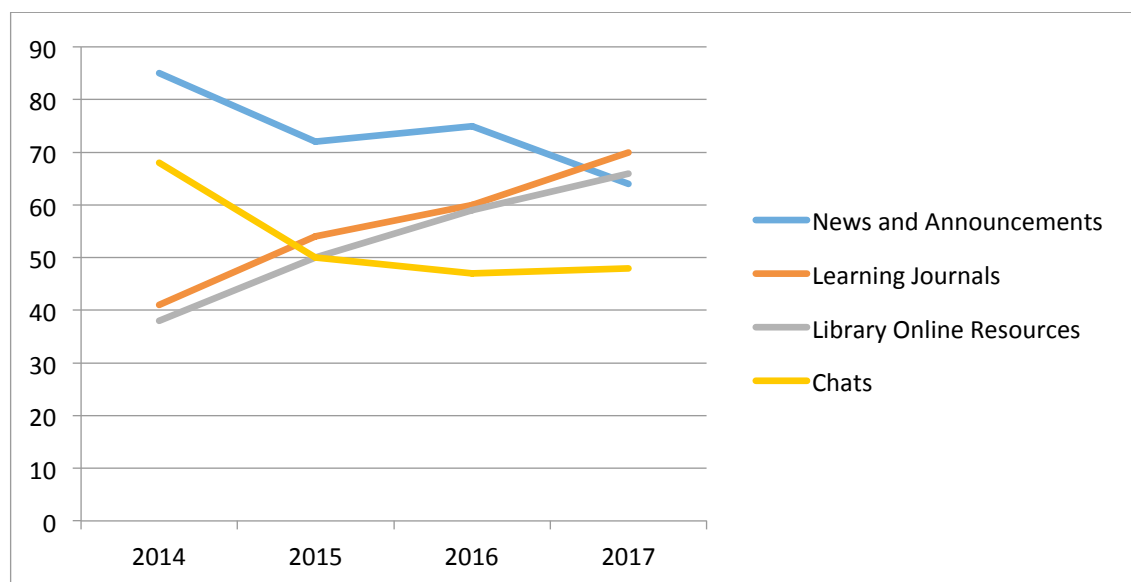


Diagram 1: Programme Overview Chart

The results presented in Table 1 and Diagram 1 above indicate that over the years there has been a steady increase on the use of both the Learning Journals and Library Online Resources by students. This observed increase should be considered to be a positive behavioural pattern that must be encouraged and reinforced to promote utilisation of available online resources. However, accessing of the News and Announcements, and Chats services seems to have declined from 2014 to 2017. The observed decline on the use of these two services is a worrying factor that should be addressed, as these are the main communication channels that students should put to maximum use. Without LA it would

have not been easy to pick these divergent patterns of student behaviour for remedial action to be taken.

Table 2: Foundations of Educational Leadership

	2014	2015	2016	2017
Module Content	6	31	55	63
Readers	4	-	48	49
Forums	4	41	57	72
Major Assignment	13	57	56	69
Journal	-	-	51	71
Chat	19	-	55	44

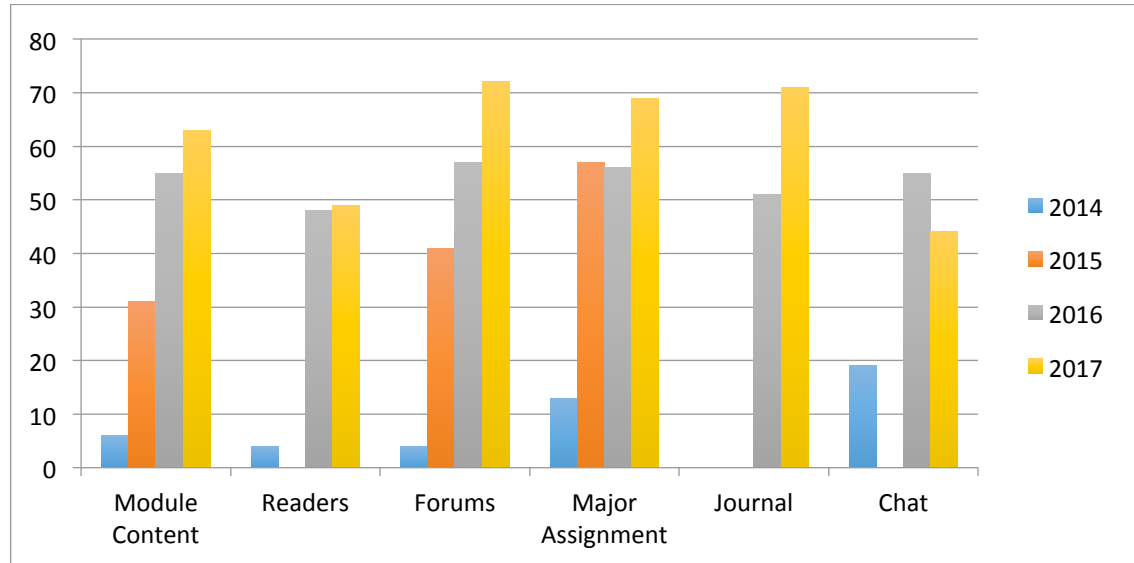


Diagram 2: Foundations of Educational Leadership Chart

The results above indicate that in the “Foundations and Leadership” programme, access to the six variables increased from 2014 to 2017, except for Chats, which experienced a slight drop in 2017 compared to 2016. It also shows that some services were either very low or not provided for in 2014.

Table 3: The Culture of Leadership

	2014	2015	2016	2017
Module Content	-	31	44	57
Readers	-	-	-	-
Forums	-	41	49	64
Major Assignment	2	57	46	63
Journal	-	52	46	56
Chat	-	-	41	39

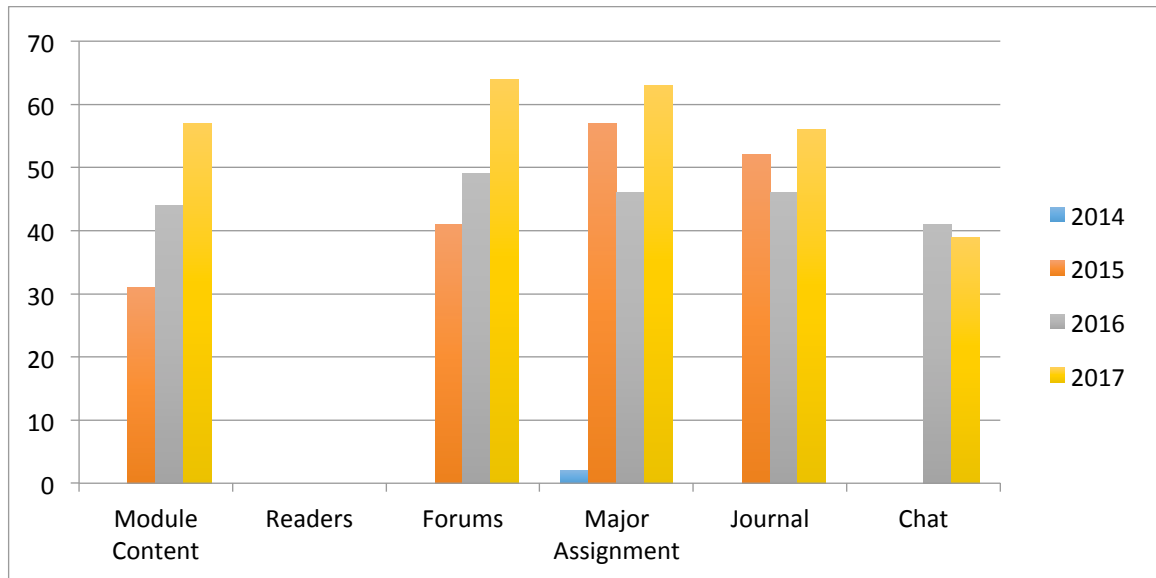


Diagram 3: The Culture of Leadership Chart

Table 3 and Diagram 3 present the results for the “The Culture of Leadership” course. The results indicate that there were no online readers available for students to access to date. However all the other variables have shown variable growth and decline patterns of behaviour. This behaviour needs to be closely monitored to establish the reason for it.

Table 4: Curriculum Leadership: A Creative Approach to Theory and Practice

	2014	2015	2016	2017
Module Content	77	45	43	39
Readers	-	44	-	-
Forums	71	48	42	51
Major Assignment	61	43	45	43
Journal	66	42	40	41
Chat	-	-	43	-

Table 4 and Diagram 4 below present the results for the “Curriculum Leadership: A Creative Approach to Theory and Practice” Course for the period under study. As is the case with the previous course, readers were also not made available online, and was not possible to compare their access over the years. However unlike is the case with the previous courses, the trend with this course shows a rather declining pattern over the years. It is necessary to do a more specific investigation on this course to establish if there were specific reason for this.

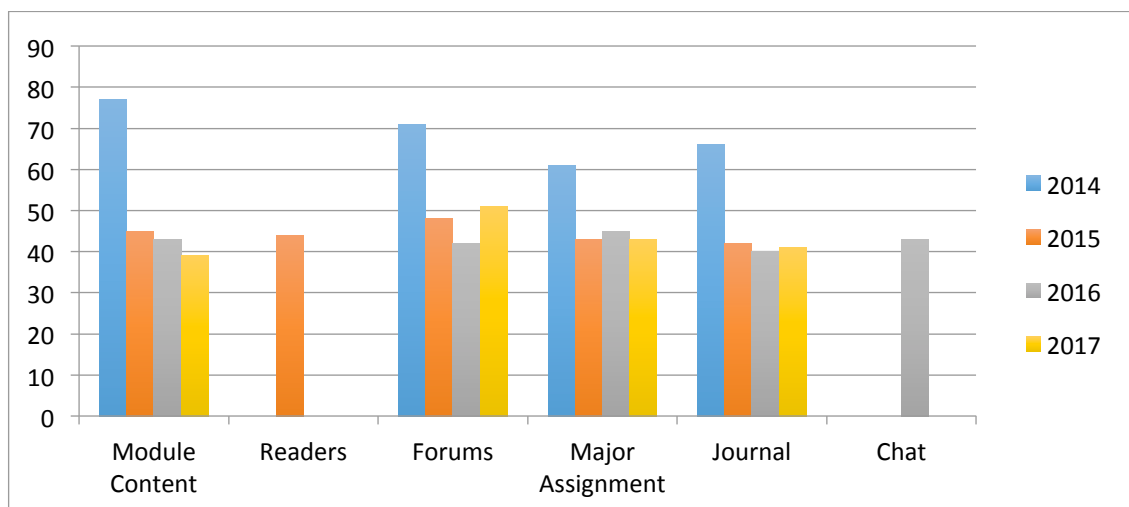


Diagram 4: Curriculum Leadership: A Creative Approach to Theory and Practice Chart

Table 5: Leading Educational Change

	2014	2015	2016	2017
Module Content	65	33	36	34
Readers	-	-	-	-
Forums	-	47	39	37
Major Assignment	55	32	38	28
Journal	50	28	31	26
Chat	-	30	34	-

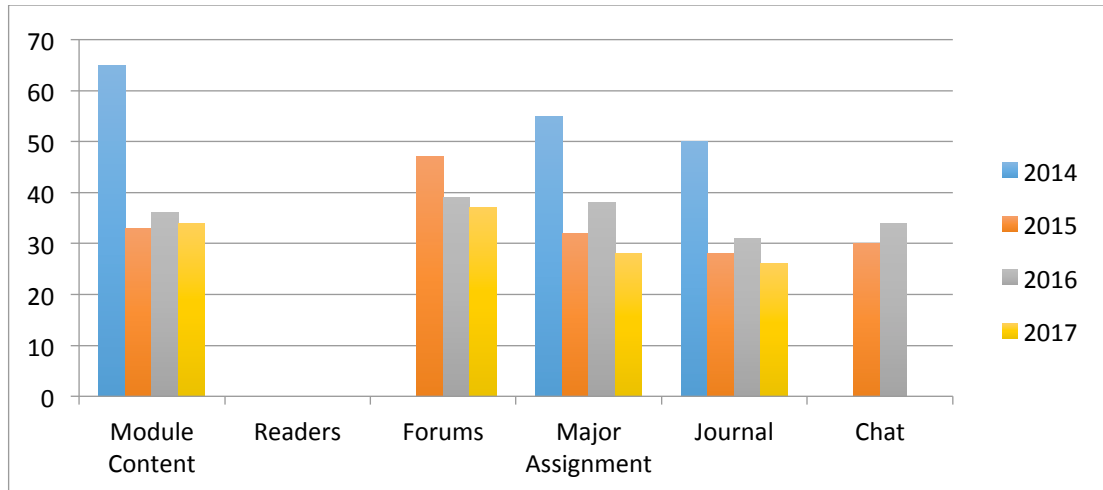


Diagram 5: Leading Educational Change Chart

The results for “Leading Educational Change” Course as presented in Table 5 and Diagram 5 above also indicate a similar trend to those of the previous course. This is one other course, which seems not to have been provided with a set of Readers for students reading and reference to in the course of their study.

Table 6: Leading Educational Systems

	2014	2015	2016	2017
Module Content	59	36	29	28
Readers	17	26	20	-
Forums	58	38	28	35
Major Assignment	-	27	32	19
Journal	27	22	26	19
Chat	-	-	12	20

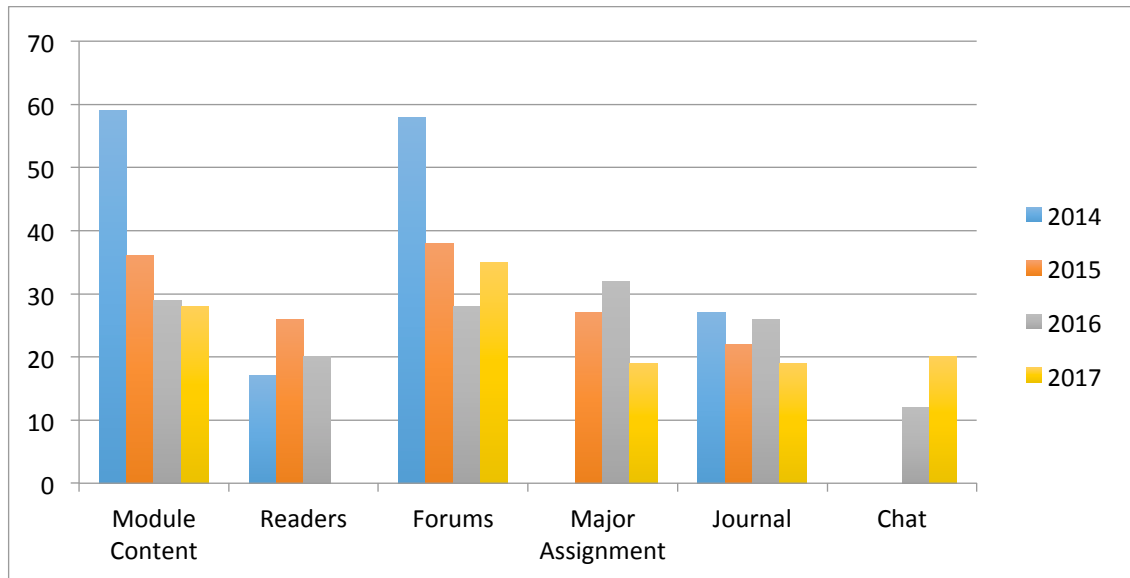


Diagram 6: Leading Educational Systems Chart

The results for “Leading Educational Systems” Course as presented in Table 6 and Diagram 6 above also indicate a similar trend to those of the previous course. It is not clear why Chats were not used in 2014 and 2015 for this course, while Forums were actually used.

Table 7: The Future of Education in the Developing World

	2014	2015	2016	2017
Module Content	68	40	40	44
Readers	69	40	35	40
Forums	69	43	46	53
Major Assignment	68	43	45	46
Journal	65	39	42	50
Chat	53	-	11	32

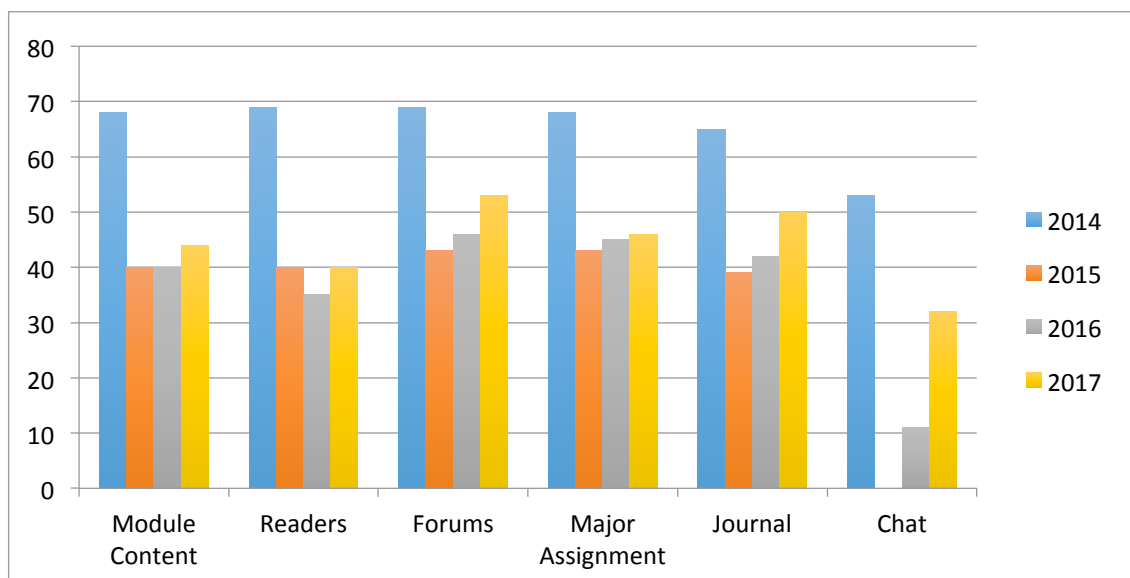


Diagram 7: The Future of Education in the Developing World Chart

The results for “The Future of Education in the Developing World” course show a huge drop in the use of all the online services between 2014 and 2015, there is a gradual increase over the years. As presented in Table 7 and Diagram 7 above the results indicate a big growth specifically on the use of Chats in 2017 compared to 2016.

Discussion and Conclusion

The most prominent findings coming out of these results are that the main services of the LMS portal that students' access in this programme are: the module content, Readers (if available), Forums and Assignment submission. However the numbers decrease for the other services such as Journal and Chat services. The design of the module content revealed gaps in the provision of reading resources for some modules this might result in compromising the student performance. There is a need for a standardised course design structure to ensure consistency the design and layout of courses across the programme. It is noted that where readers for the course content are provided students tend to visit the site. Given the wide and remote catchment areas for BOU MEDEL students provision of such resources could enhance learning. The study suggests that BOU could utilise LA data in the LMS system to develop intervention strategies that could promote quality teaching and learning. Since the university outsource part-time tutors to deliver its programmes, LA data for the MEDEL programme suggests the need for close monitoring of course delivery and the students learning environments. Using data sets around learning activities of the students and the digital footprints they left on the visits to the announcements activity of the MEDEL course, in-depth investigation is required to unearth the cause for the decline in this activity. It is therefore very critical that institutions embark on developing effective strategies for managing and sharing data with interested stakeholders such as students, staff and researchers in ways that are supportive, sensitive and secure. It is important to underscore the importance of the need to provide researchers with adequate support to enable them to fully utilise LA effectively.

At a local level Botswana Open University has taken a deliberate decision of crafting policies, strategy frameworks and implementation plans to guide its agenda of becoming a Digital Flagship. The University has also embarked on a project to promote harnessing of its online data for purposes its Learning Analytics agenda as it strives to find ways of improving on its teaching and learning services. It is observed that the benefits of LA revolved around the following; targeted course offerings; curriculum development; student learning outcomes; behaviours and processes; personalized learning; improvement in instructor performance and enhancement of educational research. The University is aware of Ethical, Confidentiality and Security issues associated with LA as it mines and analyses data from its LMS. To address these, the university has developed a pack of tools including, A Learning Analytics Policy and Staff & Student Learning Analytics Guides for its implementation. Educational institutions are likely to need a comprehensive data governance structure, drawn up with reference to local legislation, to help them to deal with these issues (Slade & Prinsloo, 2013). The issue of training for staff to capacitate them with the necessary skills and knowledge on the appropriate use of Learning Analytics has also been recognised as a key components for its success within the institution. Educators need to consider and be aware of the models of teaching and learning that underpin any set of analytics, and the categories of action and interaction prioritised by those models (Griffiths, 2013).

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