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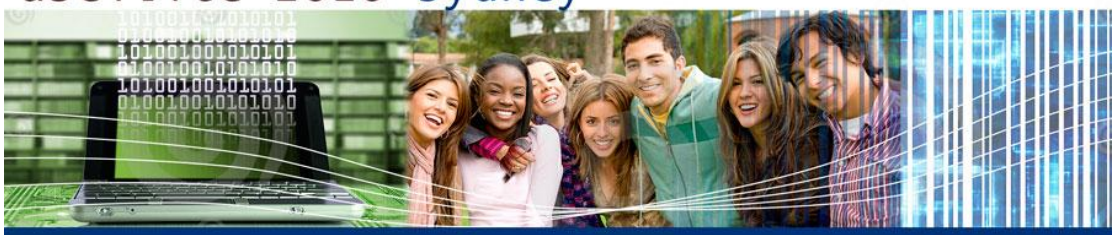

Academic involvement with the LMS: An exploratory study

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There is growing interest in the use of academic analytics however most of the reported work is being done at the level of institutions, and groupings of courses within those institutions. This study is an exploratory case study aimed at analyzing an academics' involvement with the Learning Management System, the student's involvement with the LMS, and the links between the LMS, the academic, and the students.

Keywords: LMS, engagement, LMS features, staff interaction, academic analytics

Introduction

Academics are a critical factor in learning and teaching and Radloff (2008) argues that staff commitment is the number one factor in any discussion on improving learning and teaching. While the concept of student engagement has been extensively explored within academic discussions (Kuh, 2003; Dawson & McWilliam, 2008; Beer, Jones & Clark, 2009; Kearsley & Schneiderman, 1999) the notion of staff engagement has not been extensively explored. It is worth noting that the expectation is that engaged staff will show the same attributes as engaged students, as well as attributes peculiar to academic work.

> Academic staff who are engaged in creating quality learning experiences are likely to show similar attributes and behaviors including enthusiasm for their subject and for teaching, commitment to students and their learning, interested in learning about their students and how to help them learn, and scholarly in their approach to learning and teaching. Above all, engaged staff are prepared to be learners themselves in order to achieve change in learning and teaching (Radloff, 2008, p. 4).

Linking LMS usage to engagement, "the time, energy and resources student devote to activities designed to enhance learning at university" (Krause, 2005, p. 3), will aid in reflecting on academic practice and could potentially facilitate engaged teaching, moving the academic from the centre, incorporating real world examples, incorporating reflective methodologies, and shifting the emphasis in teaching from content to dialogue (Hollander, Saltmarsh, & Zlotkowski, 2002). This study focussed on how an academic interacts with the LMS, how the LMS is used by students, and how these interactions create involvement. Fresen (2007) in researching web-based learning identified staff interaction with students as one of the key factors in student engagement. Dawson and McWilliam (2008, p. 27) also point out that it is not only staff interaction that is crucial, "the quantity of 'teacher

presence' *and* quality of 'teacher presence' are influencing factors in developing and maintaining student online engagement."

Examining the data to inform a lecturer's LMS usage aids in formulating ways to open up dialogue to enhance the student's learning journey. As Palloff and Pratt (1999, p. 12) explain, an important part of the learning process is the "interaction among students themselves, the interaction between faculty and students, and the collaboration in learning that results from these interactions".

Underlying the adoption of features, and academic experience in teaching and learning, is the notion of student involvement/engagement, "generally considered to be among the better predictors of learning and personal development" (Kuh, 2003, p. 25). The underlying principle is that the academic 'should' use tools and media that support learning tasks, and that are used to support activities. Learning is socio-cultural in nature, and it is a social activity occurring within a specific timeframe and place (Dyson & Campello, 2003). As well as the place, and the tools used to create learning opportunities, it is the way that academics, and students, use the tools provided that creates opportunities, "[m]embers take part in the activity because they have mutual objectives they believe will be achieved" (Lave and Wënger, 1991, cited in Dyson & Campello, 2003, p. 15).

LMS are, therefore, spaces within which social groups are created, and kept cohesive if the units within the LMS are working together, the tools, the academic, the student and the communication and collaboration spaces. A course within an LMS is such a social activity. Students and teachers are members of a group performing tasks to achieve their objectives. While engaged in the course members use artefacts such as lecture notes, journals, and web pages to perform tasks.

Project methodology

This is an exploratory study that investigates what has occurred within the LMS at CQUniversity using data mining as a technique of enquiry and exploration to inform the future use of Moodle. The study:

1. Examined the LMS features within the University and how academics and students use those features
2. Examined the data to see what is occurring in a single academic's course sites in terms of content, forums, hit counts, and grade

At CQUniversity a substantial amount of data is available at the backend in the LMS database. The data has been saved in a form accessible via a SQL command, which is designed to manipulate and retrieve data stored in relational database products, such as Blackboard and Moodle. The data has been stored since 2004 through to 2010 and estimations are that there are over 300,000,000 hits stored in this site. The study has been conducted using a purely quantitative analysis of the data within, what can be classed as a very complex educational setting. The patterns revealed by the data queries reveals relationships between users and the LMS; and patterns of behavior between users, content, and communication pathways.

Results

University wide use

The first feature examined was the way that academics had historically used the Discussion Forum within Blackboard, the previous LMS. 73% of Course Coordinators have no postings to the forums. In terms of university practice only 27% of staff posted to forums. This data gives the indication that academics are focussed more on content than in creating opportunities for discussion and community. (See Figure 1)

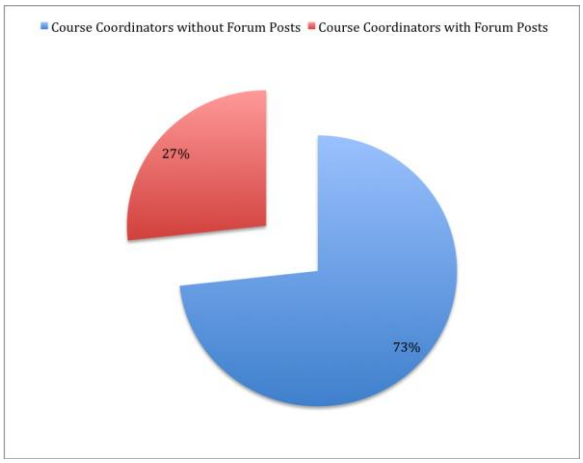

Figure 1: Course coordinators posting to forums in blackboard

To examine whether or not an LMS is content oriented or communication oriented, a query was conducted examining content within courses at CQUniversity. One of the interesting findings from preliminary research into Blackboard (Table 1) demonstrates that from 2005 to 2009 (Term 1) the courses with content files have grown 28% over those four years, with the average files per course rising by 18. There appears to be an interesting pattern developing, though more research needs to developed in this area, while files per course has increased the hit counts per student has not risen in the same manner as would be indicated by the data. One possible link here is that students are downloading the files, then printing them out to read at a later date.

Table 1: Content files on Blackboard 2005 – 2009, and average hits per student

Year	Courses with Files	Avg files per course	Avg ext. links per course	Avg hits on files per student
2005	50%	10.14	2.46	6.68
2006	75%	20.21	5.77	9.50
2007	78%	23.80	9.56	18.45
2008	71%	23.77	9.95	18.07
2009(T1)	78%	28.17	14.01	18.52

The pattern that emerges from the data is that content far outweighs communicative practice on Blackboard across all courses through 2005 /2009 T1. The huge difference between content and communication demonstrates that the majority of academics appear to not utilize the communicative networked focused features within the LMS.

Moodle data, from term 1 2010, gives a very different reading on the query run above (Figure 2).

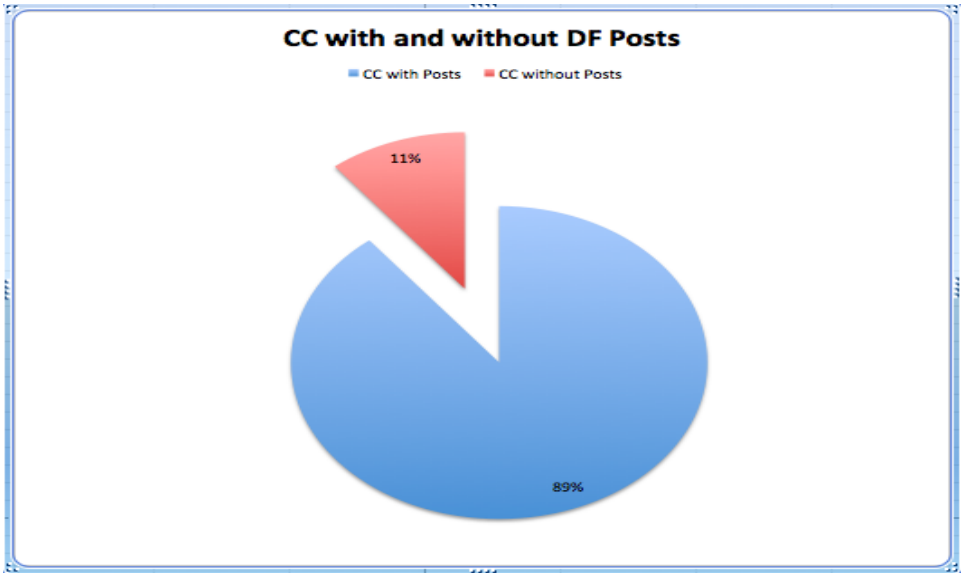

Figure 2: Course coordinators without discussion forum posts

The Moodle data demonstrates that the number of Course Coordinators that post to Discussion Forums has risen from the previous LMS from 27% to 89%, a 62% rise in the number of academics utilizing the Discussion Forum in Term 1, 2010.

A note of caution is needed here, as a further examination of the data looking at those Course Coordinators with five posts or less to the Forums, gives us the results that of those Course Coordinators with five posts or less has dropped to 67% (Figure 3).

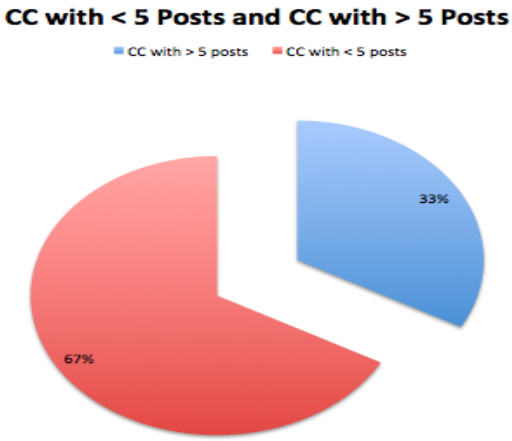

Figure 3: Course coordinators with less than 5 posts

Courses

One of the first things examined within Course 1, Course 2, and Course 3 is the dichotomy between content and communicative practice. What was examined was that the course had both content and communication features.

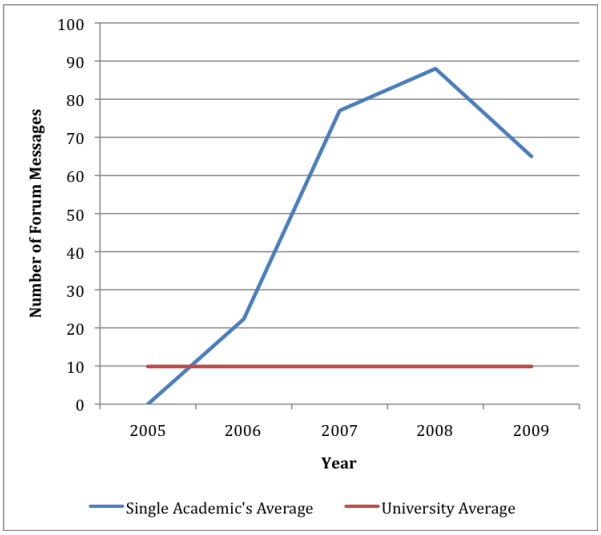

Figure 4: An academic's number of forum messages compared to the university average (all courses)

The result (Figure 4) indicates that there was a high level of communication occurring in the course Forums that the academic coordinates compared to the average for all academics across all courses at CQUniversity. In fact, the use of the forums by the academic seems to be relatively consistent across all three courses. The placement of content and communication features within the courses examined in this study would indicate that the academic is communication focused. While the academic has posted to the forums and replied numerous times, this result does not examine if these responses in the forums are significant in terms of quality, which Dawson and McWilliam (2008) argue is essential to building student engagement.

Course 1

Course 1 is a first year course that is an essential subject for one of the professional programs at CQUniversity. It has been running in its current form since it was developed for Blackboard in 2005. It has only had the one academic teaching into it, though it does have a team approach to writing content, and evaluation. Most years, markers have been used though the Coordinator has been the same academic.

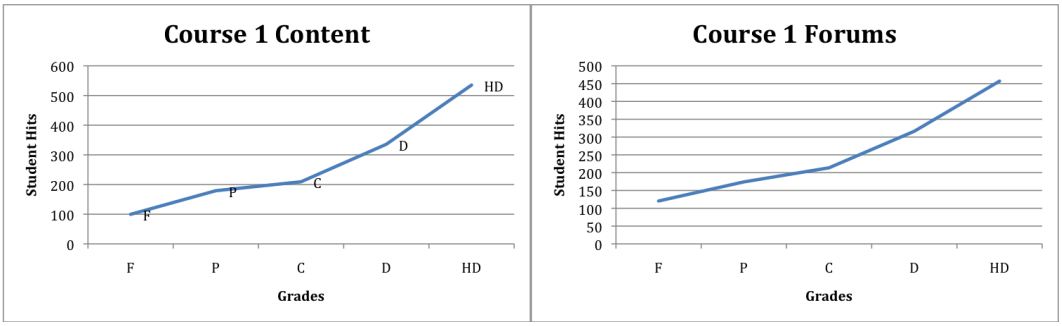

Figure 5: Student hits for course 1 - 2005-2009

Running the data-mining query, hit counts on forums and content, on the first of the three courses to be analyzed (Figure 5), demonstrated that content files, and the forums were on a par with each other.

Table 2: Course 1 - Content and forum files on Blackboard 2005-2009

Course 1	Student #	Student %	Content hits	Forum Hits
F	104	16.1	99.58	120.46
P	80	12.4	179.18	174.08
C	162	25	209.36	213.72
D	213	32.9	335.74	316.31
HD	88	13.6	535.14	457.032

The total number of students for Course 1 is 647 with an average of 66 per term. Failure rate is high; an average of 104 students failing the course, 16.1%. The students who failed were also the ones who did not utilize the content nor did they utilize the forums averaging <99 content hit and <120 forum hits compared to <535 content hits and <457 forum hits for the HD student cohort (Table 2).

There seems to be a direct link between student hits and grade (Beer et al, 2009; Dawson & McWilliam, 2008), both in content and in the forums. While this is one of the first year courses it highlights the need for students to engage with the content and the forums, though it seems as though the higher the grade the better the engagement with content and with other students and staff via the forums.

Course 2

The second course analysed is another first year course which is an essential specialty course in the suite of courses in the discipline (Figure 5). The course has been run in its present form since moving to Blackboard in 2007. Markers have been used in 2007 though none since that year. The same academic has been the Coordinator, and the content has been written by a discipline team.

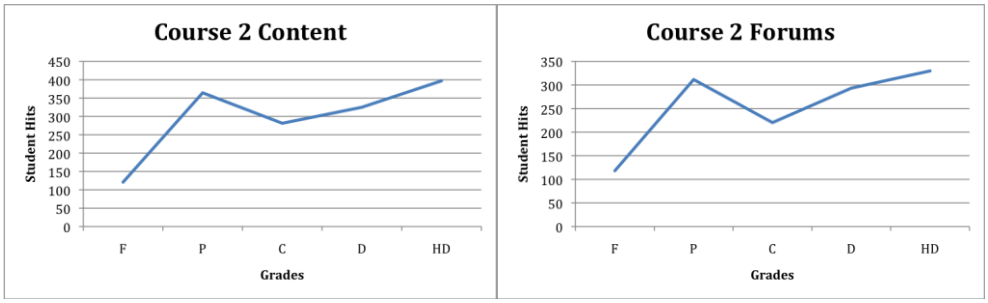

Figure 5: Student hits for course 2 - 2007-2009

Students grading is linked to their participation in the course forum as well as their linkage to the course content.

Table 3: Course 2 - Content and forum files on Blackboard 2007-2009

Course 2	Student #	Student %	Content	Forums
F	54	20.6	120.90	118.15
P	40	15.3	364.3	311.47
C	54	20.7	281.29	220.24
D	80	30.7	324.97	293.21
HD	33	12.7	396.87	329.74

The total number of students for Course 2 is 261 with an average of 87 per term. Failure rate is high with 54 failing the course, 20,6%. The students who failed were also the ones that did not utilize the content nor did they utilize the forums averaging <120 content hits and <118 forum hits; compared to <396 content hits and <330 forum hits for the HD student cohort (Table 3).

While the trends in Figure 5 demonstrate some interesting patterns, especially the dip with the Credit students, identifying the reasons behind these patterns require additional research methods, including surveys. However, the suggested pattern reveals that there is a link between student hits and student grades (Beer et al, 2009; Dawson & McWilliam, 2008) though the link is much weaker in this Course than in the previous course. Of course, whether this link is causal requires more research. This is a good example of the complexity of using the "LMS indicators" to measure the performance of staff, there are other factors that need to be taken into consideration which is outside of the scope of this study but interesting for future research.

Course 3

Course 3 is an advanced course and only available to third year students who must have successfully passed four other courses in the discipline. The content has been written by the academic who is also the Coordinator and tutor, and no other markers have been used in this course.

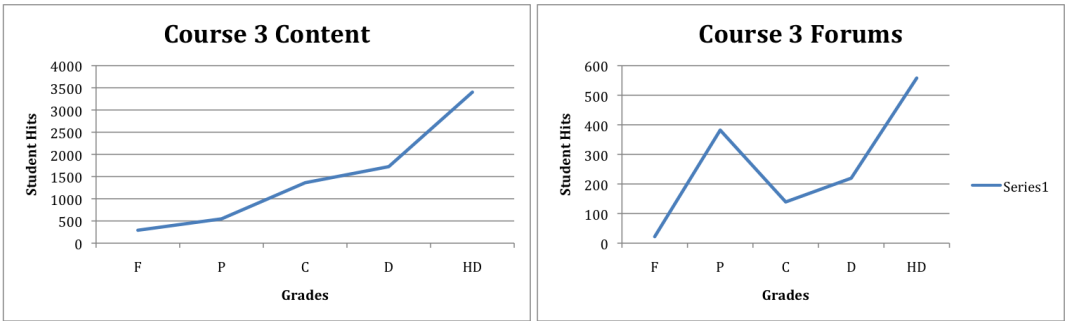

Figure 6: Student hits for course 3 - 2005-2009

Analyzing the third course gives a similar pattern to the other two courses (Figure 6). There is a link, though this has not been established as causal, between hits and grade.

Table 4: Course 3 - Content and forum files on Blackboard 2006-2009

Course 3	Student #	Student %	Hits	Forums
F	3	2.4	291	22
P	13	10.7	547.25	382
C	22	18.7	1361.3	139.3
D	48	39.7	1723.75	219.53
HD	35	28.9	3401.87	557.86

Failure rate for Course 3 is low, with only three, 2.4% out of the total number of 121. The average number of students per term is 30 (Table 5). The students who failed averaged 291 content hits and <22 forum hits compared to <3401 content hits and >557 forum hits for the HD student cohort (Table 4).

While hit counts on the content and the forums for Course 3 are high, much higher then Course 1 and Course 2, the underlying reason is that this course is conducted solely via the LMS, all of the student contact is via the LMS, all of the assignment preparation is completed via the LMS, and all contact with the Lecturer is via the LMS. While the data does not show a direct correlation between hits and grade there is only a small number of students within this course, and it is mostly on campus students. More research needs to be done, but a possible cause could be that the academic's communication focus supports on-campus students; therefore, they need the LMS less than other courses?

All Courses

Linking final grade to use of the LMS features seems to indicate that there is a link between what is happening on the LMS, the user behaviour, and grade.

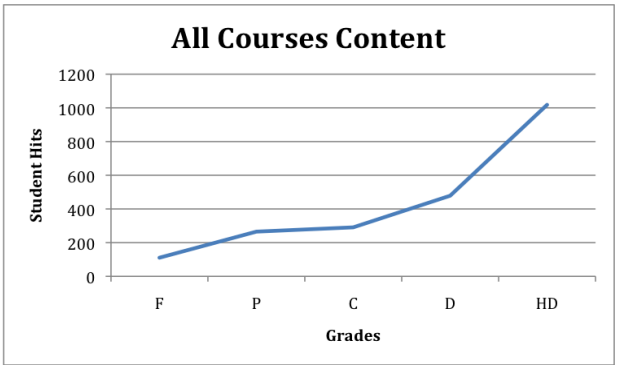

Figure 7: Student hits for all courses 2004-09

Dawson and McWilliam (2008) argue that grade seems to be an indicator of involvement and although they do not state that there is a causal relationship, something is occurring. Aggregating all of the academic's courses into one data set demonstrates that there is a relationship between students' use of the LMS features and their final grade. Examining the total of all these courses across all terms that

they have run on Blackboard (Figure 7) demonstrates that there is a direct link between student hits and grades (Beer et al, 2009; Dawson & McWilliam, 2008) and between student engagement with the forums and grades, which is indicative of involvement with the courseware.

Table 5: Content and forum files on course 1, 2, 3 years 2005-2009

COMBINED	Student #	Student %	Content Hits	Forum Hits
F	161	15.6	110.62	116.85
P	133	12.9	265.36	246.46
C	238	23.1	290.86	210.55
D	341	33.2	478.54	297.98
HD	156	15.2	1018.14	442.88
	1029			

The average failure rate for combined courses is 15.6%, with an average of <110 hit per student on contents and <116 hit per student on the forums. High Distinction students for all courses averaged <1018 hits on content and <442 hits on forums (Table 5).

The data clearly indicates that all courses developed by the academic have provided what Krause (2005, p. 13) outlines as 'opportunities for online discussion, collaboration and interaction'.

Implications and future directions

Kearsley and Schneiderman (1999, p. 1) discuss the nature of engaged learning, learning that leads to student involvement, that involves "[motivating] students to learn due to the meaningful nature of the learning environment and activities". The most important part of this is 'the meaningful nature of the learning environment and activities'. Analytics is not just the application of data mining, it also has to connect to what is known about teaching and learning, staff conceptions of teaching/learning and how to get staff to improve teaching/learning. Not only is the 'quantity' of academic involvement necessary but also the 'quality' of that involvement. More research is needed to extract the meaning of 'quality', and subsequently, analyse the courses for such 'quality'.

The research demonstrates that there are linkages between the academic and students, there are linkages between the LMS features and the academic; there are linkages between grade, student behaviour online, academic behaviour online and feature use. What the study does not do is to come to any conclusion whether these linkages are critical and causal or whether they are the casual and accidental. The data revealed in Course 2 and 3 indentify some interesting and unexpected patterns. While there has been research that demonstrated that there is a link between LMS participation and grades (Dawson & McWilliam, 2008), Beer et al (2008) showed that this correlation was strongest for FLEX students, weak, but there, for CQUniversity on-campus students, but absent for AIC students. This exploratory study has indicated that the broader averages shown in Beer et al (2008) are hiding courses where the correlation does not hold (Course 2 and 3).

Future research needs to be conducted using the same quantitative framework examining in detail the different student cohorts (flex students, online students, International campus students) utilizing Moodle as the LMS; as well as examining Courses 1, 2, and 3 through time comparing the one course over all offerings to see whether there are any differences in the data, between terms and years. This study has highlighted the value of individual analysis of courses beyond the global. In this way, an understanding of user behaviour can be constructed that would aid the academic in the development of courses, what works and what does not work.

Conclusion

This study posited the view that an academic's approach to their understanding of teaching, allied with feature adoption within the LMS, and their use by both the academic and the students create involvement, and for Krause (2005) engagement. It has been verified that there is a correlation between academic participation, discussion forums, and grade. The data from mining the LMS in this study demonstrates that the academic has high hit count, between 2300 and 10000 for all courses, demonstrating that there is involvement in the courses offered. Student activity has clearly

demonstrated that they are interacting with the LMS and the academic though there were some discrepancies that need to be researched.

The research framed an initial enquiry into the use of LMS data to identify possible indicators of academic engagement with the LMS, and consequently with students. Of particular interest is the concept that by examining the features, adoption and use, within the courses it is theoretically possible to predict if the academic is creating an environment where involvement can occur.

The academic's particular understanding of their teaching approach, allied with a place within the LMS to create a space for communication, collaboration and content dissemination, a sound understanding of assessment and the need for this to be authentic, helped by the student's own motivation, is paramount in creating student engagement. The academic is only one part of this interconnected learning. Understanding what is happening within the LMS does create an opportunity for self-reflection and analysis of user behaviour on the part of the academic.

While the purpose of this paper was exploratory in nature it does reflect patterns of user behaviour that highlight the need for future research in this area. Creating the right model for educational research into academic user behaviour and student engagement is ongoing, but it may establish a statistical relationship of some significance. From this it is theoretically possible to transfer the research data and to apply this data to academic practice, to enhance teaching and learning.

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