Determining Correlations Between Library Usage and Student Success at the Durban University of Technology: A Pilot Study

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Abstract

Thorpe et al. (2016: 373) note that there is a growing trend for academic libraries to adopt measures that demonstrate the value of the library in the context of student success. While it may seem intuitive to librarians that students who engage more with library services and resources learn more, Oakleaf (2017) cautions that providing reliable evidence to support this is not straightforward. Librarians are aware of the numerous activities students engage with in the library, and, according to Soria, Fransen and Nackerud (2013), it is important to examine the differences of each of those interactions in relation to student success. To provide reliable and contemporary evidence of associations of library usage and student success, a multi-phase quantitative student success project was undertaken at a single site library, BM Patel Library, at the start of the first semester of 2017.

The first phase of the project provided a comprehensive view of the use of physical and virtual library services at BM Patel Library by undergraduate Faculty of Management Sciences students. Five service points were identified that provided the data for this study. Statistics were collected from library entrance points, library book loans, computer use, laptop use, and off-campus use. The sample consisted of students enrolled in three departments: Marketing and Retail Management, Public Management and Economics, and Human Resource Management. These departments were selected based on the analysis of library visits of all students who visited the BM Patel Library in the first semester.

According to the ACRL findings on academic library impact on student success, there is compelling evidence that library use and information literacy (IL) attendance increases student success (Burrows 2011). There are limited local studies that attempt to determine the impact of IL training on student success. This could be due to challenges in the collection of relevant data and/or the use of the data to draw correlations to student success reliably. This paper reports on the second phase of the project, which goes beyond the data from service points and incorporates

data from three additional sources: IL attendance, IL assessment results, as well as semester marks of students in the selected departments.

Keywords: Library Measures, Library Impact, Library Data Analytics

1. Introduction

The American College and Research Libraries report on academic library impact provides compelling evidence of the impact of the academic library on student success, student outcomes, student performance, and student learning (Burrows 2011). The research provides an impetus and opportunity for researchers, practitioners, and administrators to allocate dedicated resources to case study research on the different ways the library is contributing to student learning. In addition, the research suggests that greater effort should be made in developing appropriate systems to collect, store, analyze, and connect, library and university data.

Developed institutional data warehouses offer library administrators the opportunity to connect to all data on student learning experiences. In the absence of fully integrated data systems, there is tendency to look at only 'convenient system-generated data', while internal mechanisms and systems mature. In the South African context, most universities have for some time, established data warehouses that host student data, mainly for reporting purposes. The inclusion of data sources beyond student enrolment, and student assessment data is critical for other stakeholders, like the library, to create 'new meanings' around student success.

Beyond systems, developing an institutional culture around data use is a complex process that requires strong institutional drivers, to move from the university using data for mandatory and/or external reporting purposes, to using data for answering strategic questions (forecasting, predictive modeling, and optimization). To enable this culture, the following are some of the strategies employed at the Durban University of Technology (DUT): handling mistrust issues around data and its use; the inclusion of key stakeholders in the data planning teams; allowing open and wider access to data, as well as providing training opportunities to develop data analytical abilities across the university.

According to Booth and Hendrix (2015), libraries are well positioned to lead, facilitate or manage, or play a major partnership role in institutional data projects. At DUT, the Library is part of both an institutional student success task team and a data planning team. The data planning team provides leadership in the development of the institutional data warehouse, as well as capacity

development programmes in data analytics. These initiatives have been the catalyst for numerous research projects in both Faculty and Academic Support departments, including the Library.

2. Context

The Durban University of Technology (DUT) is a public university that offers mainly undergraduate, as well as postgraduate qualifications. A large proportion of our students are funded through the National Tertiary Funded Assistance Scheme. Recent national student movements on 'Decolonization of Education' have led to a significant increase in the number of first year students who now receive 'free' education. DUT students are mainly first generation students, and come from diverse educational and social backgrounds. This diversity brings many challenges and opportunities to the delivery of a quality education.

DUT Library is seen as an integral player in the University, participating actively in strategic University forums for student development, academic integration, and research. In the past two years, a significant injection of capital expenditure has helped redefine our library spaces, develop new library spaces and buildings, and equip libraries with suitable technology.

Although represented as a support department within the academic sector, DUT Library is considered a partner in the holistic development of the student in their academic journey. Taking into account the diversity in educational and social backgrounds of the first year students, as well graduate attributes, information literacy, academic literacy, and general education, are key components of the academic curriculum. The library's flagship information literacy (IL) programme is offered across the undergraduate curriculum, including foundational and general education courses. The success of the IL programme lies in the customization that can be offered depending on course and curriculum requirements. IL integration is aimed at the assignment level, where formal assessment of student learning is facilitated.

To support student learning, an extensive collection of print and electronic information resources is available to students. Although seen as a requirement for the curriculum, the use of print books by students is on a constant decline. A move to e-book collections has not seen any considerable change in reading habits of undergraduate students. However, IL integration efforts in partnership with Faculty is seen as a key driver to improving the use of resources. The provision of electronic resources also brings about challenges in terms of access to technology. There is a high

dependency on the library to provide access to Library computer laboratories, loans of laptops and other devices, and support for IT-related issues.

There is limited research on this topic in the South African context, which tends to focus on library loans and student performance. This could be due to a general acceptance that our students are unique, and that it is difficult to demonstrate value when numerous social, economic and cultural variables can impact on student success; that university library and data systems are underdeveloped and disconnected; or that, beyond systems, an institutional data culture exists that focuses on using data for reporting purposes only.

3. The Library Data Project

It has been the practice of the Library to collect system-generated data, mainly from the Integrated Library System and other vendor systems, as well as manually collected data about the physical use of the Library and its facilities and student attendance of Information Literacy training. Without a valid, reliable way to collect data from various library and enterprise systems, it is difficult to quantitatively assert how a library adds value (Cox and Jantti 2012). In the conceptual phase of the Library Data project, all data owners and data sources were identified (including storage formats and frequency), and new data sources that should be collected for the project. To ensure reliability of the data collected, several sub-projects followed: automation of service points and facilities, development of a Library statistical database, and new methodologies for collecting data were implemented. Figure 1 highlights the various stages of the library data project.

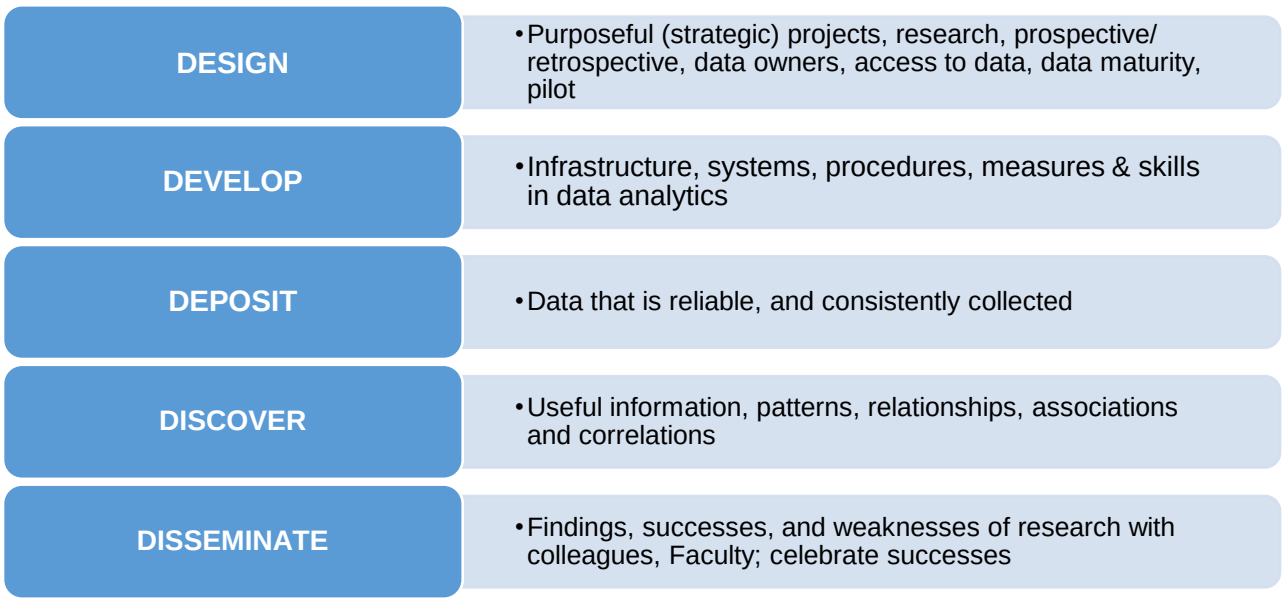

Figure 1: Stages of the library data project

The anticipated outcomes of the Library Data Project were to:

- understand usage beyond traditional library measures;
- demonstrate *how* the Library contributes to teaching and learning outcomes/student success; and
- improve data maturity and capacity to use data in the Library.

The Library Data Project was piloted in two phases.

3.1 Phase 1: Understanding Library Usage

The first phase involved the implementation of entrance access control to collect data on student visits, the development of a Library statistical database for the collection of all library data, and an analysis of library interactions. An analysis of entrance data was done to determine the users of the physical library. Based on the student number that is scanned by students, the course name and Faculty are also known. The researchers chose a sample for the study based on the top three departments that visited the Library in the first semester of 2017, and which had IL integration in the department's general education module. Data was then consolidated from five (5) critical points where students interact with the library: visits, book loans, PC logins, laptop loans, and off-campus access to Library information resources. For the sample departments, the data was

analyzed to look at student visits to the Library vs student usage of the Library. Results from the study showed that there was a strong association between the library visits and library usage. 61% of the students visited the Library, had interacted with the library, 6% did not visit, and had no interaction with the library, and around 6% did not visit, but used off-campus resources. The majority of the students visited the library between 10-50 times, and had between 5-15 interactions. Students who visited the library around 75 times, had an equal number of interactions with the library—see figure 2. Similar patterns of usage and interactions appeared for the remaining two departments. The findings of this study were shared at an Institutional Research conference in 2017, where it was accepted as valuable input to Faculty, in the design and delivery of courses.

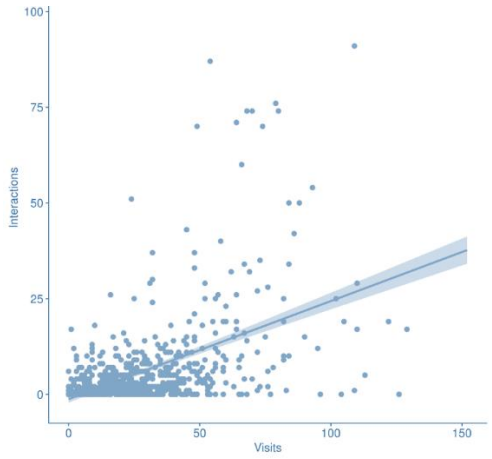

Figure 2: Associations between library visits and library use for DEPT A.

3.2 Phase 2: Determining correlations between library usage and student success

The efforts by the Library in implementing systems to collect data reliably were successful. By the end of 2018, the Library project team were confident that all relevant library data for the study was now being captured systematically on the library statistical database by data owners. While the initial focus of the second phase was to include IL and course marks for 2017, the project team adjusted the research goals to include 2018, thereby enabling a comparison of data for the same departments.

The major challenge faced by the project team was access to the departmental course marks for the period of study. Leading authors on library data analytics draw attention to the accessibility, availability, and usability of faculty course data:

> [r]esearch correlating libraries with student learning and success … also requires data that serves as a surrogate for student learning and success, such as course grades, retention rates, graduation numbers, or initial workplace learning … this data can be too imprecise, completely unavailable, or inaccessible due to institutional silos … it lacks the finer levels of granularity required for useful analysis (Oakleaf et al 2017).

Faculty data required for the study included 2017 and 2018 general education course marks (embedded library assessment mark) and course marks. Institutional ethical approval for the research paved the way for the library project team to gain access to the student data, with necessary permissions from Faculty. Minor concerns relating to sensitivity of the student data, as well as privacy issues were addressed with Faculty. During consultations with departments, it became evident that there were minor differences among the departments, in the offering of general education modules and capturing of library assessment marks, however, this would not have not affected the outcome of the study. While access to the data was granted by the three departments, only DEPT A provided the library with a complete set of student data.

4. Methodology

The sample for phase 2 was based on the top users of the library as identified in phase 1, but was limited to only first year students from departments that offered library integrated general education courses. The procedures for analysing the library data and student course data is discussed below. The student number was the primary key to track the library visits, interactions, IL attendance, and student marks.

a) Library usage data analysis procedures

Entrance count: Students scan their student cards at the entrance using a standard barcode scanner, the data is captured in a database. The scanning of the cards is a voluntary process, and students are made aware at the service point that the data will be used by the library for research purposes. A bar graph is displayed showing students the number of visits per day for the month. Any barcode that is scanned is stored in the database; the system does not verify the registration status of the student. The IT department provides the library with a complete list of registered students with their faculty and departmental code. This is used in conjunction with the scanned barcodes and their timestamp to produce a list of departments with counts of students who visited during the defined period.

Circulation of library materials: Print materials, such as books, are loaned to students for use outside of the library for a limited duration. It is not necessary for students to borrow items for use within the library, however; although circulation staff attempt to record this usage as in-house usage when returning books to the shelves, no student number is associated with the use of the item. Another category of item that is issued to students for use within the library is the short-loan or reserve item. Use of these items is recorded in the same way as ordinary loans. Whenever an item is issued to a student, the transaction is recorded on the database of the integrated library system (ILS) as a 'charge'. A charge record is maintained by the ILS for every user.

PC reservations: Two laboratories are each equipped with 30 Internet-connected PCs for student use. These PCs are in constant high demand so a reservation system, Libki, is used to allocate a daily time allowance to each student and limit the duration of their sessions, thus allowing other students the opportunity to use a PC. Even if not currently in use, a student must reserve the PC prior to use. When a student reserves a PC, they authenticate against the central Active Directory service, restricting this service to registered students. When a student logs into a PC, claiming their reservation, their student number is recorded in the Libki MySQL database along with the timestamp, client location and client name.

Laptop loans: Laptop computers are loaned to students for a limited duration. The library system is used to record the transaction. Similar to records of print materials that have been borrowed, loans of laptop computers can be extracted from the charge history of the student.

Remote access: EZProxy is used to provide students access to sites outside of DUT's network with resources that DUT subscribes to, such as electronic databases and journals. Access to these resources from within DUT's network does not require authentication, so only remote access is recorded. When a student requests access to a resource and they are not on DUT's network, they will need to log into EZProxy, which authenticates them against the Active Directory directory, verifying that they are a registered student at DUT. EZProxy records the student number, date and time, and the site that was accessed, along with the HTTP code. From this data it is possible to generate a list of all student numbers and the sites that they successfully visited during a specific time-frame.

Combining the above indicators: entrance + pc logins + ezproxy logins + book loans + laptop loans = library average usage indicator (LAUI).

IL Attendance: Students that attend IL classes fill in a class register which is captured retrospectively on the library server. Three IL classes were held for the general education module. Based on their attendance, a mark of 1-3 was assigned to each student. IL attendance was not included in the LAUI, to enable future comparative research with departments that offered fewer IL classes for the same courses. For the purposes of analysis, IL attendance is named library information literacy attendance (LILA)

b) Library Related Course Marks and Course Marks - 2017/2018

Dept A course marks is divided into two parts: library related courses and full course mark. The library related courses (IL and academic literacy) were combined as the library-related course indicator (LRCI). An IL examination mark is included in the LRCI. The full course mark includes the LRCI, and is named the course average indicator (CAI).

c) Analysis of the Data

The data that was available for analysis consisted of the following:

User ID	Library average usage Indicator (LAUI)	Library IL attendance (LILA)	Library related course indicator (LRCI)	Course average Indicator (CAI)

Table 1: Data categories

An open source statistical software, R was used to examine the fields to determine if there was a relationship between the LAUI (Total Interactions), LILA, LRCI and CAI (Average). R is an integrated suite of software facilities for data manipulation, calculation and graphical display (R Foundation). The following fields were analysed to determine a correlation between the different variables:

2017: DEPT A: LAUI and LRCI; LAUI and CAI; LILA and LRCI

2018: DEPT A: LAUI and LRCI; LAUI and CAI; LILA and LRCI

d) The use of P value and r value for analysis

The P value refers to the probability of the null hypothesis being true, that is, that student marks do not improve when students visit/interact with the library. A value of less than 0.05 is conventionally taken as suggesting that the null hypothesis is false, and that there is a correlation between using the library and student marks.

Pearson's ‘r’ value is a measurement of the strength between two variables, the extent to which knowing the value of x helps predict Y; that is, that students interactions may result in a higher score. The value ranges from-1 to 1, so a value of .75 would indicate a high positive correlation.

5. Discussion of results

5.1 Library Visits

The library visits for 2018 is represented in figure 3. Students from Dept. A accounted for 15 % of total library visits in 2018. This is an increase of 6 % of total visits from 2017.

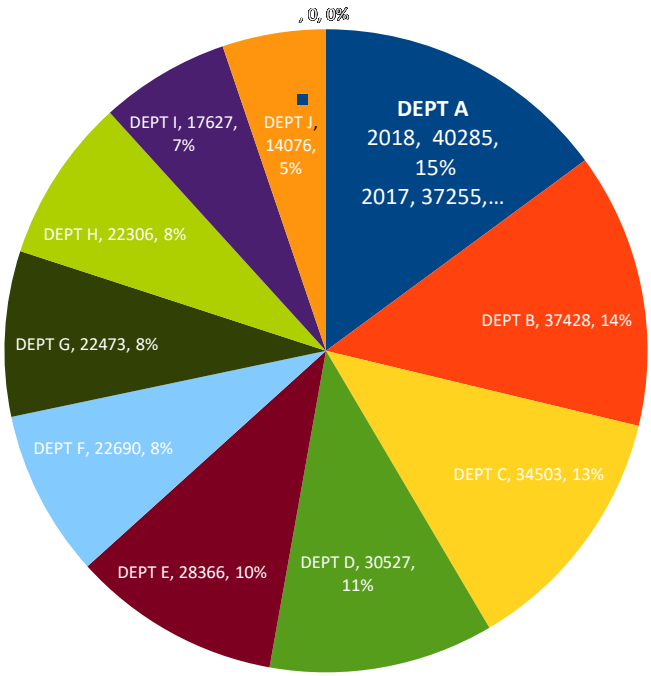

Figure 3: Total visits 2018

5.2 Library usage vs course marks

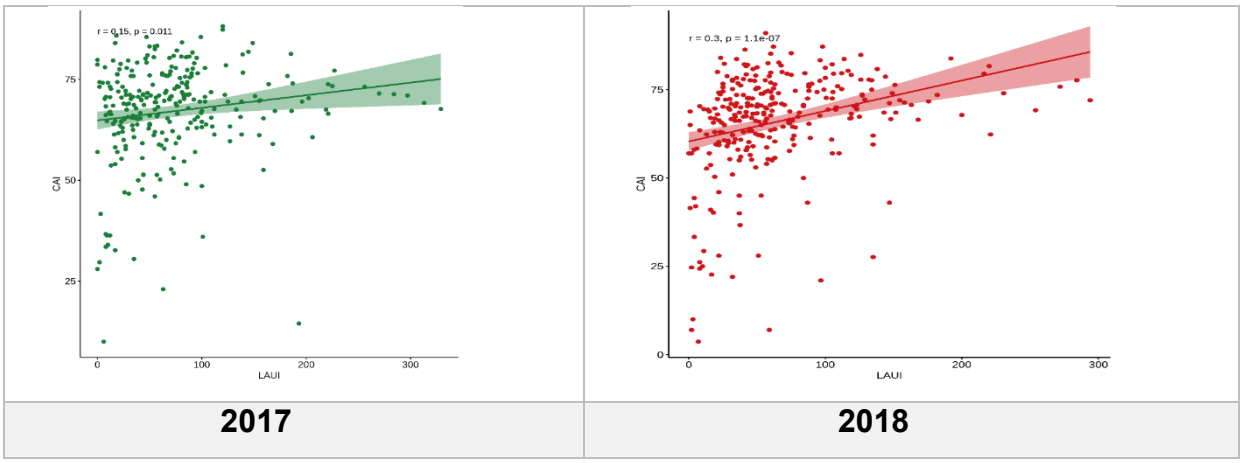

Figure 4: Library usage vs course marks

Based on the P and r values, in 2017, there is little correlation between library usage and course marks, and hence, no evidence to support that library usage has an effect on student performance. There is a notable change in 2018, where there is a correlation between library usage and course marks, providing evidence that usage has an effect on student performance for this course in the given year.

5.3 Library Usage vs Library Course Mark

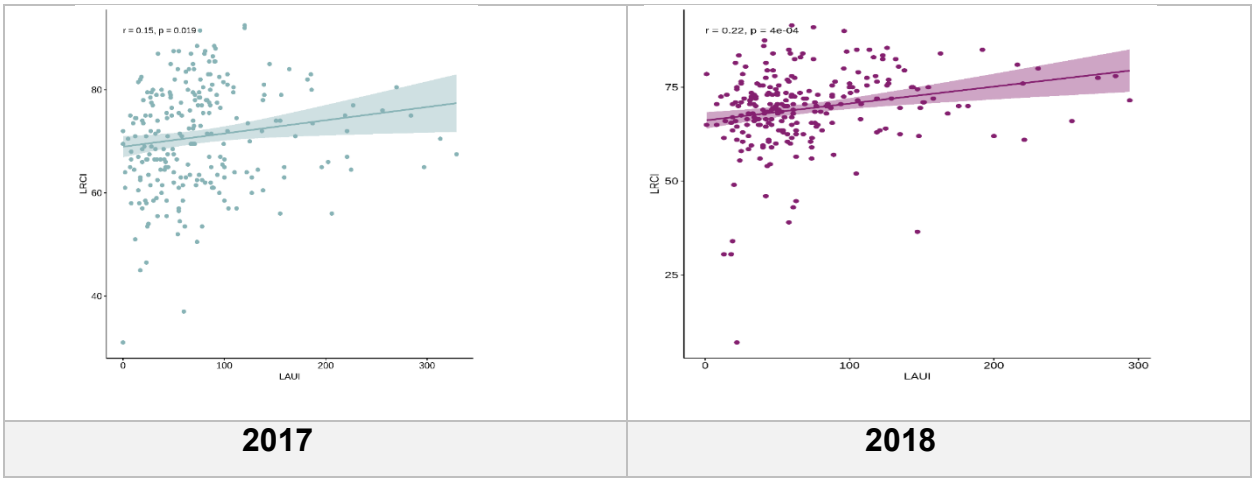

Figure 5: Library usage vs library course marks

Similar results are noted for library usage and library course marks. In 2018, there is evidence that library usage has an effect on student performance in the library course.

5.4 IL attendance vs Library Course Mark

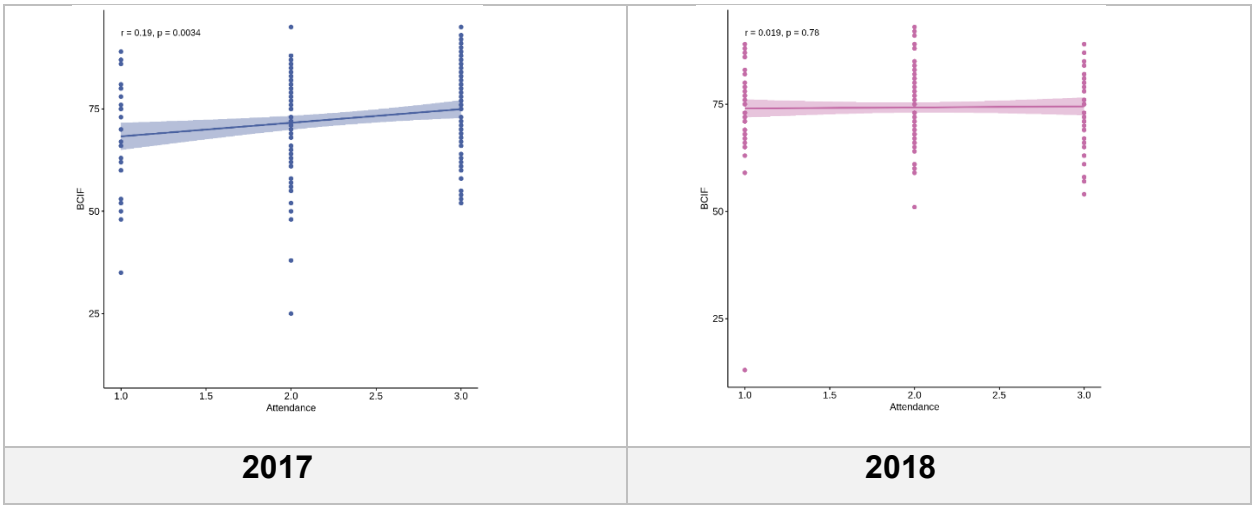

Figure 6: Library IL attendance vs library course marks

DUT Library invests heavily in providing information literacy training in the curriculum. Based on this, there would be a general expectation by academics and librarians that IL attendance should have an impact on the library course mark. The results in 2017 show a positive correlation between IL attendance and IL course mark, however, in 2018, there is no evidence that attendance has an effect on performance.

6. Discussion

In departments where there is high investment in IL integration, there is evidence to support the contention that the library plays a role in student success. This applies to both library usage and library course marks and course marks. The difference between the results for the two years suggests that there may be value in further interrogation of the IL program and its value to student success.

The authors note the value and limitations of correlation studies in determining relationships between variables, and in this case, library usage and course marks. The research undertaken provides useful points of interest for further research to examine the relationship between library usage and student success.

The results differ between the two years and this demonstrates the dynamic nature of an integrated IL programme, which needs to adapt to changes in mainstream curriculum. A detailed

analysis of the changes that occurred in the delivery of the IL programme over the two years would provide insight into the impact of individual factors that contribute to student performance. These may include course delivery, assessments, or course design.

The authors acknowledge the exclusion of other library usage indicators such as printing and photocopy as well as on-campus usage that could have influenced the outcomes of the study. Systems have been implemented to determine accurate usage of these indicators and these data will be included in further studies. Further, while this study focuses on library usage measures, there are opportunities to examine the relationship between non-usage of the library and student performance.

7. Lessons learned

There are limited studies dealing with the impact of the library in terms of student success within the South African context, despite the huge challenges we face in terms of student success rates. Academic libraries need to make time for library research, by developing suitable structures that allow for library research productivity.

Undertaking research that involves student data brings with it many challenges. Access to student data, accuracy of data, addressing ethical issues, deeper understanding of module and course weighting and assessment practices are all crucial to outcomes of the research.

8. Recommendations

The authors aim to complete the pilot project among the three departments set out in the sample to determine if there is any similarity in the results across the three departments. Further, based on the methodology tested in the pilot, a retrospective cohort study and prospective cohort study is planned for both foundational and mainstream IL programmes.

There are also opportunities to undertake similar studies in departments where there is limited IL integration to determine how these students performed in the course.

9. Conclusion

The research has contributed to the voices in research on libraries and their contribution to the student learning. The research has broadened our understanding of library usage

beyond traditional library measures, as well as demonstrated that there is a positive relationship between library usage and course marks, as well as between IL attendance and course marks.

As a further outcome of the research, the researchers have had the opportunity to learn new skills, and have created excitement around library data among library staff and Faculty. This research has helped DUT Library take early steps in developing enabling systems for supporting and building a research culture in the library.

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