Impacts & outcomes: searching for the most elusive Indicators of academic library performance

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Abstract

Many indicators of academic library effectiveness have been accepted and implemented, but it is clear from the literature that measuring objectively the *impact* of academic library services has remained an intractable problem. While it is recognized that the value of library services is a multidimensional construct that will not easily be captured by single or simplistic measures, one of the major goals of academic institutions has always been the education and qualification of students that conform to certain standards. Academic libraries in turn have aimed at the provision of resources that assist students in complying with these standards. This presentation suggests that with two different approaches to the correlation of use data with final grades obtained at a South African university, it was indeed possible to demonstrate practically that students' academic achievement may be positively associated with using the library.

Introduction

One of the early writers on performance evaluation in library and information services, Orr, had emphasized that one should not try to establish how good a library is, but how much good it *does* (1973: 317). Many others have quoted this maxim and have battled with the intractable problem of how to demonstrate the impact of information services. It is generally agreed that the ultimate outcome of using a library is neither a simple construct nor something easy to measure. Some writers have even proposed that it may be impossible to find a valid measure for the impact of library services, as "one cannot separate knowledge derived from library use from that from other sources" (Poll & Boekhorst, 1996: 21).

Libraries provide many services to different user groups, whose needs and requirements may differ markedly and sometimes even be in conflict. For this reason it has often been stated that meaningful performance evaluation is impossible without a clear understanding of the goals and objectives of the parent institution. One cannot tell how much good is done if one doesn't know what good one is *supposed* to be doing in the first place. In academic libraries, these goals are usually tied to supporting their institutions' own goals of teaching and research.

Researchers are no longer trying to find one single measure or indicator of impact either. A number of writers had tried to prove goodness by combining in relatively complex mathematical statements, different selections of input and output measures. These attempts have by now been abandoned, perhaps at least partly as a result of the fact that mathematical expertise is relatively rare among library managers (McDonald & Micikas, 1994: 15).

Library goodness conceivably means different things to different people. One researcher might rate a service as "excellent" when an important document is located and delivered so that a research paper could be completed in time, while a doctoral student could value the librarian's assistance with the preparation of a reading list. These activities are related to supporting the research goals of an academic institution. Measuring the impact of library services in support of research activities is subject to very specific investigations such as counting the research publications from an institution and attempting to establish the extent to which the library had an active role in assisting the researchers with their information needs.

As far as undergraduate students are concerned, however, an academic institution "can only legitimately assess itself on how effectively it develops the talents of its students" (McDonald & Micikas, 120) as this is the core of the academic endeavour. Or as Wells stated: "Undergraduate students have known objectives; their main aim is in terms of academic success" (1995:121). Undergraduates come to academic institutions to gain enough knowledge, experience and skill to become graduates in their chosen fields. A library that wishes to serve this population should legitimately ask itself how much it has contributed to that process of enabling students to graduate.

Attempting to show correlation between library use and academic achievement is not new either. A number of writers, mainly in Australia and the USA, have attempted to investigate whether students who use (or do not use) their libraries, tend to do better or worse academically. In the 1960's, Barkey had found a direct correlation between books borrowed from the library by 'freshmen' and their grade point averages, but he had also been concerned by "the high incidence of nonuse of libraries" (1965:115). Russel et al. (1982) found that students with higher grade point averages

were much likelier to use the library than students with lower averages. Hiscock (1986) was unable to prove that a strong relationship existed between library usage and academic performance. Self (1987: 36) on the other hand could show (with reference to a library's reserve collection), that "[h]igh-users do better than medium-users, who do better than low-users who do better than non-users". He did, however, also point out that although these differences were clear, they were small and he was unable to show that they had any predictor value (38).

Some consistently recurring findings have appeared in association with investigations of the relationship between library use and academic achievement. A number of writers have commented on issues relating to short loan or reserve collections, such as the perception that short loan collections might actually discourage students from using their open shelf collections (Self, 30) and that these collections are themselves both expensive and underutilized (34). The danger that reserve readings might become the primary source of readings for undergraduate students was pointed out by Jordan (1998: 50) and Lane had noted earlier that reserved books were the most used items of all library materials (1966: 278).

Writers have also been concerned about findings suggesting that that academic libraries were generally underutilized, that many students never used their libraries, or used them only as study venues (Lane, 1966: 278; Mays, 1986: 57; Breivik & Wedgeworth, 1988: 170). Barkey found that a disturbing number of students did not use the library at all (115). Mays suggested that libraries were not used very much by undergraduate students, because library use was not encouraged or rewarded by lecturers (51), that students frequently had no need to use their libraries (51) and that library use may be "superfluous to success in the academic programmes of those who do use the library" (57). McDonald and Micikas commented that library collections will not be heavily used unless requirements for library use are built into curricula (13).

It has been emphasized that the extent of library use very much depends on courses of study (Whitmire, 1997). Students in the humanities, languages and literature have a far greater need for borrowing books (Lane, 280; Wells, 1996: 158) while they are less used by students in the "more scientific and career-oriented disciplines" (Russel, et al. 10-12). Kramer & Kramer found a significant correlation between grades and library use among students majoring in the arts, but not for students majoring in science or engineering (1968: 311).

It is acknowledged that book borrowing is but one aspect of library use and a number of authors have commented that a true measure of outcome would also take into consideration the use of other library materials beyond borrowing books (Wells, 1995:123). Other authors have suggested that disciplines where low book use is demonstrated may make greater use of the serials collection and this should be investigated. It is also becoming increasingly necessary to assess the impact of the use of electronic resources on academic activity. From the point of view of the undergraduate student, however, Wells pointed out that a "book collection available at their home campus is still crucial to the academic success of undergraduate students" (1996: 158).

A new investigation

For this researcher, the relationship between academic performance and library use remained one of those questions that would not go away. Together with Jordan it is believed that the library should be seen as "an integral part of the educational enterprise" (115) and that demonstrated correlation between library use as expressed by borrowing materials, and academic success can provide librarians with a powerful output measure to show in tangible terms the value of library services to undergraduate students.

A few years ago an attempt was made (and reported in a poster presentation at the very first Northumbria conference in 1995) to see whether it was possible to show that students with high academic scores had borrowed more books from the library than students with low scores. The library computer system at the University of Cape Town (UCT) at that time was rather limited, but it was possible to collect enough data to find that undergraduate students of History and Sociology who achieved the highest marks in a given class also borrowed more books from the open shelves (not necessarily from the reserve collection), than students who achieved the lowest marks. Borrowing books, on the other hand, seemed to have no influence on the marks of students of Economics. The inevitable response to these findings was that economists didn't read books anyway and what about students of all the other subjects that had not been investigated?

Shortly after concluding this investigation, the circulation module of the UCT library system was changed and it was no longer possible to get hold of students' borrowing records at the end of each academic year. So it became the question that wouldn't go away: do students who do well at university borrow more books from the library than students who do poorly?

Fortunately, even computer systems get replaced eventually. By the end of 2000, new software made it possible to obtain the necessary data from the library system and the question could be investigated once more.

Methodology

As first degrees are one major output of our university, the population was limited to students in their final years before graduating with a bachelor's degree. Subjects were selected that were served by the main

university library, thereby excluding areas such as medicine, music, law and architecture, which have their own branch libraries. Core courses in the broad subject areas of economics, psychology, social science, science, engineering and language were therefore sought and class lists noting the final marks in each of the selected subjects were obtained. From these class lists (which are posted on public notice boards) the students achieving the highest and the lowest marks were identified. No group of high or low scorers was smaller than ten or greater than twenty. Reports were generated from the library circulation system to indicate how many items from the open shelves and from the reserve collection respectively, were borrowed by each of the identified students during the academic year. For the sake of anonymity, student numbers only were used to generate these reports.

It should be noted that although the students were identified on the basis of their scores in one particular subject field, the loan records did not reflect borrowing activity in that subject only, but their total borrowing throughout the academic year. While final year students normally do two majors, it was therefore assumed that a student who did well or poorly in a single major subject would be representative of a student who did well or badly in the final year of the course.

It was acknowledged from the beginning that borrowing books is only one, and possibly not even the most important, library activity for many undergraduate students. A number of writers including this one (1991) found that undergraduates value the academic library in the first place as a place to study. Students in certain disciplines may use serials or electronic resources more frequently than books. For this study, however, book borrowing was regarded as one indicator of library use. Support for this position is to be found from Mays, who suggested that borrowing was "an accurate predictor of overall use of the library collection" (58).

Findings

Table 1: Classes and Marks (Summarizes subjects, sample sizes and average low and high marks):

Subject	Class Size	Sample Size	Low score: average mark	High score: average mark	Whole class: average mark
Chemistry	43	23	49%	72%	59%
Economics	266	36	48%	74%	61%
Electrical Engineering	85	37	45%	80%	65%
Environmental & Geographical Science	57	29	52%	74%	64%
English	117	31	47%	79%	66%
History	47	21	53%	74%	64%
Psychology	230	36	43%	75%	60%
Sociology	46	22	48%	69%	60%

Average mark over all classes selected (n = 891): 62.2%

In order to pass a subject at UCT, a minimum mark of 50% is required; third class marks fall between 50–59%; second class marks are between 60–69%; upper seconds range between 70–74% and from 75% denotes a first class pass. In the eight subjects selected, there were a total of 891 students of whom 82 (9.2%) obtained first class passes, 106 (11.9%) upper seconds, 360 seconds, 274 (30.8%) got thirds and 69 (7.7%) failed. The overall average mark was 62%. Table 1 shows that apart from Environmental & Geographical Science and History, the lowest marks on average in the other subjects were failures. The mean highest marks were first class passes in Electrical Engineering, English and Psychology. The smallest classes were Chemistry, Sociology and History, while the largest classes were Economics and Psychology. It is noticeable that class averages are fairly consistent over the different disciplines, ranging between 59%–66%, with an overall average of 62.2%.

Table 2: Borrowing by Subject

Subject	Open shelf low score average loans	Open shelf hi score average loans	Short loan low score average loans	Short loan hi score average loans
Chemistry	13	22	14	6
Economics	2	14	25	33
Electrical Engineering	11	8	3	3
Environmental & Geographical Science	8	19	18	22
English	31	33	30	26
History	31	36	32	28
Psychology	21	37	7	30
Sociology	30	15	20	18

Table 2 indicates the loan records and the differences in borrowing activity by low and top scorers. It is apparent that borrowing activity varies a great deal from subject to subject. The heaviest borrowers were students of History and English, the lowest were from Electrical Engineering, followed by Chemistry. Seven students (of whom three studied English) had borrowed more than 70 books and six out of the seven were from the high scoring categories.

Top students in Psychology, History and English borrowed the most books, both from the open shelves and from the Short Loan Collection. In English and History there is not a great deal of apparent difference between the borrowing of top and low scorers. Sociology students borrowed somewhat less than the first three groups, but this was the only subject where low scorers borrowed *more* from both the open shelves and short loan than the high scorers.

As far as the sciences were concerned, Chemistry students borrowed slightly more from the open shelves than students of Environmental and Geographical Science. Electrical Engineering students borrowed the least from short loan. The least open shelf borrowing was among the top scoring Economics students. By and large, therefore, the findings of previous writers that students in the humanities and languages borrow more books than students in the sciences, are upheld.

It is clear that there is some correlation between high marks and high borrowing of library materials from the open shelves. In all the subject areas apart from Electrical Engineering where the number of loans were very low and in Sociology, the number of items borrowed from the open shelves was higher among the students with the high scores than among those with the poor scores.

As far as borrowing activity from the short loan collection was concerned, the expressed fears that undergraduates may come to rely entirely on such pre-selected works and not use the open shelves much, do not seem to be justified. In English and History, where the highest rate of borrowing of open shelf materials was noted, borrowing of short loan materials was high as well. In Economics and to a lesser extent Environmental & Geographical Science, the use of the short loan collection was *more* than the use of open shelf material.

Significance

It is not possible, however, to state on the basis of these average scores that the differences are statistically significant. The standard deviations were very high as a result of large individual differences in borrowing behaviour. It became obvious, for example, that odd students could obtain first class passes (75% or more) in Economics, Engineering and even in English without ever borrowing a single book throughout the entire year! Some students on the other hand borrowed more than sixty books and although these high borrowers usually were grouped among the top students, students in the low categories also sometimes borrowed more than fifty. In one case a student who failed his subject (Sociology) had borrowed more than a hundred books.

As a result of the large spread in standard deviations mentioned above, it was not possible to test for significant differences between the two sets of samples by using the t–test, which is one generally accepted way of testing for significant difference between the means of two samples. The Mann-Whitney test, which is used to compare two independent groups of sampled data (TexaSoft), was therefore invoked to test whether the apparent differences between the upper and lower scores in the sets of sample marks could be shown to be statistically significant.

The results may be summarized as follows:

Table 3: Significance

Subject	Open Shelf Borrowing: difference between top & low scores	Short Loan Borrowing: difference between top & low scores
Chemistry	Significant p .025	Not significant
Economics	Significant p .05	Not significant
Electrical Engineering	Not significant	Significant p .05
Environmental & Geographical Science	Significant p .10	Not significant
English	Not significant	Not significant
History	Significant p .10	Not significant
Psychology	Significant p .001	Significant p .001
Sociology	Not significant	Not significant

From Table 3 one may conclude that the circulation of library materials indeed correlates significantly with academic achievement in certain subjects. In Psychology, this correlation is highly significant and one may confidently state that students who on average obtained a first class mark (75%) used both open shelf and short loan materials much more than the lowest scorers who failed the course (average 43%; pass mark 50%).

A particularly interesting observation is that the English students, one of the most actively borrowing groups, borrowed comparable numbers of books, regardless of whether they obtained high or low marks. While this finding cannot therefore be used to demonstrate that library use is related to academic achievement, this may be seen as a particularly powerful indicator of a demonstrated need for library materials: *all* students had used many library materials and even those who had failed had done so. A similar observation is evident among the History students, even though a small significant correlation could be distinguished between the use of open shelf materials and obtaining top marks. This finding provides strong support for earlier writers who stated that students in the humanities, languages and literature have the greatest need of library materials.

A surprising finding was the significant correlation in Economics. My previous investigation had failed to establish any significant correlation between loans and achievement. This time it was possible to establish that although the borrowing of open shelf material was not high among the top scorers in Economics, they used open shelf books significantly more than students who failed.

The need for borrowing library materials among students of Sociology seems to require investigation. Although the differences could not be shown to be statistically significant, top scorers borrowed fewer books than students who failed.

A further look

It was then decided to attempt a measure of triangulation and an additional context for students' lending behaviour, by investigating further the borrowing patterns of undergraduate students who borrow large numbers of books. The purpose of this investigation was to establish how the marks of undergraduate students who borrow the most books over all, compare with good or poor marks from the previous investigation.

A further sample was therefore drawn from all undergraduate students throughout the university who had borrowed the most books during the academic year. The sample consisted of 104 students who had borrowed more than 135 books from the open shelves during 2000, from a total undergraduate student body of nearly 12,000. The student who had borrowed the most books had taken out a total of 421. Of the 104 students in the sample, the final marks of 20 of them were not available, leaving 84 undergraduate student records. Students ranged from first to final years, but were simply grouped according to their courses of study. Some heavy borrowing activity was evident from groups that were not represented in the previous sample. Students of music, architecture, law, fine art and medicine all appeared in the second sample but were left out of the first as they are not served by the main library because they have their own branch libraries at UCT. As students in different courses and different years of study take varying numbers of subjects each year, it was decided to record the marks of their two best subjects in every case.

Some surprising results came to the fore:

Table 4: Students who had borrowed the most books from the open shelves during 2000 by course of study

COURSES taken by students in the sample	Mean Number of books borrowed	Mean Best Mark %	Mean Second Best Mark %	Number of Students in the Sample
Bachelor of Arts	151	73	69	25
Music	183	80	74	19
Architecture	162	81	76	15
Law	238	69	66	6
Bachelor of Social Science	175	67	63	6
Bachelor of Science	157	72	69	5
Fine Art	148	71	69	5
Medicine	221	75	67	3
MEAN	181	76	71	Total = 84

Of the students who had borrowed the most books during 2000, the largest group were Bachelor of Arts students served by the Main Library, followed by students of music and architecture, who have their own libraries. Of the 84 students selected, only eight (five from science, three from medicine) were not from disciplines broadly regarded as the arts and the humanities. The evidence of the marks seems clear. In not a single case had even the second best mark been a failure, while 54% of the best marks were first class passes. In the first investigation, the marks of 891 students were on average 62%, well below the "best mark" scores in all the courses of study indicated above. Students who borrowed exceptional numbers of books, obtained much higher than average marks in at least one and even two subjects, although the differences may then not be as great. The deduction seems inevitable: undergraduate students who use their libraries a lot, also do well in their exams.

Conclusion

It has yet again been confirmed that measuring the impact of library use on undergraduate performance is neither simple nor obvious, but it has also been possible to show that students who do well, tend to borrow more open shelf library materials than students who do poorly. Many variables apart from library use impact on student performance and choice of discipline; teacher expectation and student determination all play significant roles. Of these, only the role of choice of discipline has to some extent been considered and these findings strongly uphold earlier findings that students in the arts and humanities need and borrow the most library materials.

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