Library Resources and Students' Learning Outcomes: Do All the Resources Have the Same Impact on Learning?

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ABSTRACT

This article investigates the relationship between the use of library resources and learning outcomes in a Chilean research-centered university by analyzing data from two consecutives semesters of student records, library borrowing, and access to electronic resources through the library. Results show that the access to electronic resources has a greater impact upon performance than the number of library items borrowed. They also show that an increase in the number of sessions dedicated to accessing electronic resources was accompanied by a decrease in the number of library items borrowed as students progress in their degrees. Further analyses showed that students' behavior is attributed more to the requirements of advanced courses (commonly encountered in later years of their degrees) than to personal preferences. This relationship between student records and library services enlightens the impact of different library resources on student learning and offers evidence to rationalize library investments according to their needs and impacts.

INTRODUCTION

Libraries play a key role in the university student experience. They embody core values of scholarship as repositories of knowledge (Kuh & Gonyea, 2003). They gather the products of scholarly work for public access and offer physical space where students can meet for academic work, working collaboratively and broadening their intellectual horizons (Soria, 2013). With the emergence of digital technology, libraries have advanced toward increasing provision of electronic resources such as e-books, online catalogues, reference management systems, online bibliographic databases and online journals. These resources make access to knowledge and information easier, deepen possibilities for being in touch with up-to-date and high quality materials, enhance bibliographic research, and provide tools for creating and updating personal collections of bibliographic material (see for example, Knight, 2013; McLaughlin, 2011; Taha, 2012). Nowadays, libraries provide an experience that intertwines the physical and the digital, which is in turn embedded in the broader ecology of student learning, and encompasses classrooms, learning management systems, professors, other students, and so on (Ellis & Goodyear, 2010).

In a context of competing demands for limited funding and growing student expectations, university services and programs are often required to demonstrate evidence of their effectiveness. This compels libraries to progressively demonstrate their value in more concrete terms than simply pointing to their clear academic value (Stone & Ramsden, 2013). Research on student use of library resources and library impact on academic achievement has emerged in response to this trend. Usually, librarians assess library services value by gathering students' experiences through surveys or focus groups. Some library managers and scholars question these methods because they rely mostly on self-reports and, as such, they provide only indirect measures of impact, giving a snapshot relevant only to the timing of the study. Besides, they are, especially in the case of surveys truly representative of the population, costly exercises (Cox & Jantti, 2012). Proposing a different approach, a report from the Association of College and Research Libraries (Oakleaf, 2010) posits that researchers have made little use of the data that can be obtained directly from their own institutions information systems. Students' interactions with library services and

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resources, both physical and digital, create large repositories of data, which are a rich potential source for understanding how students access library resources. Appropriate matching of these data with students' academic information can lead to a more complete picture of how students use the library (in the context of their degree) and how this is associated with academic achievement. The report emphasizes that this kind of study is the way forward toward a more authentic assessment of the value of library services.

This call for a closer look at how students use the library connects the field of library research with the emergent fields of learning analytics (LA; (Chatti, Dyckhoff, Schroeder, & Thüs, 2012; Siemens & Long, 2011)) and educational data mining (EDM; (Romero & Ventura, 2013)). These two research areas are focused on analyzing and making sense of the vast amounts of data originated from educational environments, with the aim of improving teaching and learning. They are emergent research fields in Higher Education, mainly aimed at the detection and characterization of data patterns from large sets of data, such as the ones created by students in their interaction with library services (Romero, Ventura, & Garcia, 2008).

Some researchers follow Plum, Franklin, Kyrillidou, Roebuck, and Davis's (2010) direction and have started to use data from their universities information systems – in some cases in conjunction with traditional social sciences research methods – to explore how students' use of library services is associated with their academic outcomes. Initial results from these studies show positive associations between library use and student attainment (see for example, Cox & Jantti, 2012; Goodall & Pattern, 2011; Stone & Ramsden, 2013; Wong & Webb, 2011). For example, Stone and Ramsden (2013) conducted a study on eight universities from the United Kingdom where each university's data was analyzed both independently and together as a whole. They found positive associations between academic achievement and book borrowing, a similar relationship with e-resources access, but a lack of association with library building access. Through the analysis of focus group data, the authors also found that students have a very positive attitude toward library services: they perceive a positive association between their academic attainment and their library use; they value library resources despite of the available on-line resources; they perceive that library space is for learning, using technology and meeting work mates; and, they value library personnel support. Similarly, Goodall and Pattern (2011) found that, despite university students' low rates of library services access (at least 50% of them never borrow a book), there are positive correlations between library use and their class mark. In general students with higher marks use the library more than those with lower marks. At the same time, when considering visits to the library, results show that in some universities students with lower marks tend to go to the library as much, or even more, than those with higher marks. In addition, Cox and Jantti (2012) found a very strong non-linear relation between use of e-resources and average marks by access amount ($R^2 = 0.87$), which increased if extremely poor performers were left out. Moreover, nonlinear correlation between borrowing books and average mark was also strong ($R^2 = 0.73$), although a bit less than for electronic resources. Finally, Wong and Webb (2011) found that for 5 out of 7 major academic units at their university (Academy of Visual Arts, Faculty of Social Sciences, Faculty of Arts, School of Communication, and Faculty of Science) there was a significant correlation between average mark and use of library resources. Studies such as these are in line with the purpose of providing libraries with evidence to demonstrate their value and, at the same time, adjust resources to better meet users' needs (Plum et al., 2010).

When observing the data, there are usage patterns that differ from one institution to other that require a further exploration in order to make the evidence base stronger (for example, low use of e-resources in England and high use in Australia). The present article expands this issue by introducing the outcomes of a study on possible relationships between students use of library services and learning outcomes, conducted in one Chilean research-oriented university.

In this study we focus on the relationship between physical and digital library resources and student performance. Our research questions are:

1. Is there any relationship between uses of electronic resources, access to physical library resources and students' performance?
2. Is there a change in the pattern of use of electronic and physical library resources in students at different points in their university education?

To answer these questions, we first do a descriptive and correlational analysis of the data obtained from student records, library borrowing, and Electronic Resources databases. We take into account all students enrolled in two consecutive semesters at the research-centered university involved in this study without making any distinction by degree or enrollment year. For the second question, we do an in-depth descriptive and correlational study for the same time period, taking into account the discipline to which the student belongs and their enrollment year.

METHODOLOGY

This project had access to three databases: library loans (ALEPH), electronic resources access (EZPROXY) and student academic information (DARA). Table 1 shows a general description of each database. All the data correspond to two consecutive semesters at the university, the second semester of 2012 and the first semester of 2013.

The DARA database is the main university database for students' academic and socio-economical information and it is composed of several relational tables. The university assigns a unique number to each student-degree combination, so students that are enrolled in more than one degree during their time at university have more than number. They can however be linked by their national identity number and the university assigned email. From the database table descriptions, we selected the fields that were relevant for the study: enrollment year, course marks by semester to indicate performance, degree, university school (department), national test scores (university entrance exams) to control for previous knowledge, school dependency (public, private or charter) as a proxy for student socio-economic background, gender national identity number, and university assigned email. In order to be able to identify users across databases while protecting students' identity, we applied hashing to the national identity number and the university assigned email to create a unique code that was used for indexing across databases.

The ALEPH database was simpler; we were interested in one out of three tables. The database has detailed information about the date and time the items were borrowed, as well as a classification of borrowed material in twenty different categories, from printed books to study rooms. For this study, we created a summary of students' borrowing by grouping them into three categories: Print Material, Audiovisual Material and Physical Space. These three categories account for the 95% of all the borrowed library resources.

The EZPROXY is a proxy server that mediates all students' requests to electronic journals and bibliographic databases to which the university has access; we will identify these as Electronic Resources. Its log file is a text file where each line is an instruction sent through the service together with identification information like user name (the university email), IP address, domain, and time, among other information. We associated every line as an action triggered by the user's search. Only users that access the service from outside of the university network are requested to authenticate using their user name, therefore not all of the actions in the log file can be associated to a student. However, an analysis using the IP address of the logged actions showed that in average 76.9% of the connections were authenticated, a total of 6,220,960 actions, assuring us that the set of actions that can be associated to a user conforms is a representative sample of the log file.