Quantitative/Qualitative Analysis of Assessing Student Information Literacy Skills: The Power of Librarian-Faculty Collaborations

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Abstract: Librarians at the Moore Library of Rider University conducted a focus group with 12 undergraduate students during the summer of 2011 and modified an online test used for determining students' information literacy (IL) skills in required composition classes. Based on collaboration with a Psychology faculty member, the librarians revised the pre-test with multiple correct answer questions. For those classes returning several weeks later for a follow up session, a different, but similar post-test was given. The multiple-answer format decreased chances for guessing, and the pre and post-tests show learning and/or retention of some of the IL skills taught.

Keywords: librarian-faculty collaboration, information literacy, assessment, pre-tests, post-tests, multiple correct answer questions, focus group, quantitative analysis, qualitative analysis

Introduction

Librarians at Moore Library, Rider University, in New Jersey, USA, have been conducting assessments of student information literacy (IL) skills in a variety of ways since 2002. In recent years, Google Docs have been employed to conduct online tests given to students prior to library instruction ("pre-tests"). This has made it possible to collect data and to conduct descriptive statistical analysis of the baseline measure of students' information literacy skills across disciplines and class years. Since the Fall 2010 semester, Moore librarians have conducted pre- and post-tests in required research writing classes (primarily freshmen and sophomores) and freshmen honor classes. These tests occurred prior to teaching sessions guided by the IL learning objectives set by the Association of College Research Libraries (ACRL) (2000) for college and university students. The pre- and post-test questions assessed the first two ACRL IL objectives:

1. Students will identify a variety of types and formats of potential sources of information. (ACRL IL Standards 1.2)
2.   Students will recognize controlled vocabularies; illustrate search statements that incorporate appropriate keywords and synonyms, controlled vocabularies (when appropriate), Boolean operators, nesting of terms, and truncation, refining the search statement when necessary; and determine the most appropriate resources for accessing needed information. (ACRL IL Standards 2.2 & 2.3)

At a University faculty development workshop before the spring semester in 2011, faculty members from a variety of disciplines reviewed the results of these skills exhibited by students and offered suggestions for changing the wording of questions. These minor changes in the online test were implemented during the spring 2011 semester. A focus group of students during the summer 2011 provided more reasons to refine the questions. By partnering with a Psychology faculty member in fall 2011 who has expertise in test instruments and access to sophisticated statistical software (PASW 18), librarians experimented with a new test instrument that includes multiple correct answers to questions. More in-depth quantitative investigations of the data have been possible with this partnership. In this study, the authors will discuss how the librarian-faculty team developed the test instruments for the pre- and post-tests in fall 2011, the tools used for the statistical analysis, the main findings of the study, and new strategies for future research.

Methodology

Ten online questions to determine basic information literacy skills were administered in required composition and honors level writing classes in the fall 2011 semester. Students supplied the last four digits of their Rider Identification Number at pre- and post-testing so comparisons to determine students' retention or learning were possible. This method also preserved the confidentiality of the participating students. The Rider University Institutional Review Board reviewed and approved these procedures. The tests were installed in Google Docs and embedded in the Library home page as described by Hsieh and Dawson (2010). To save the limited class time for instruction, only the early arriving students took the surveys and the surveys were closed 5 minutes after the classes started.

After reviewing the online IL test results with our co-author in the Psychology Department at the end of spring 2011, it was decided to conduct a focus group composed of undergraduate students for their feedback on the test questions for additional modifications on the instrument. Student volunteers received and signed an Informed Consent Form, Student volunteers were elicited by reaching out to several faculty and staff members, plus flyers announcing the project were placed around tables in Moore Library. In August

2011, twelve students participated in the focus group by taking the online survey and discussing each question afterwards. One librarian led the discussion and two other librarians took notes while students discussed their responses. Moore Library provided lunch and a $10 gift card to the campus bookstore for these volunteers. This activity helped the librarians to revise some of the questions, and it provided a learning experience for the students. Also, at the suggestion of the Psychology faculty member, librarians experimented with adding multiple correct answers to the questions to decrease the chances of correct responses due to guessing (Moore Library, Rider University 2011, A Few Questions).

In addition to modifying the questions for the fall 2011 semester, Moore librarians provided the answers for the pre-test with explanations to students. The answer sheet was emailed to the faculty with requests to distribute the information to the students. It was hoped that the IL concepts would be reinforced by allowing students to review the correct answers. To minimize the possibility that students might remember the pre-test questions and answers and therefore skew the results for the post-test, a different set of questions was created covering the same IL objectives for the post-test (Moore Library, Rider University 2011, Follow-Up Survey). Only the classes returning for follow-up sessions took the post-test. The data were exported to MS Excel and tabulated for descriptive analysis. SPSS and PASW 18 were used for quantitative analysis to determine if there were statistical differences and interactions among the factors.

Findings

The questions with multiple correct answers made the scoring more complicated. Several algorithms were considered as employed by Bauer, et. al. (2011). The main analysis reported here used a conservative scoring rule in which all correct responses must have been selected and no incorrect responses selected for a score of correct. Any error of commission or omission resulted in a score of incorrect for that item.

One hundred eighty-two CMP-125 students took the pre-test survey. Out of the sixty-nine students who took the post-test survey, fifty-six students (81%) had matching codes in the pre-test. Analyses comparing the full sample to the 56 students who completed both the pre-test and post-test indicated no significant differences were detected between these groups.

There were no significant differences between pre-test and post-test scores overall, $t(55) = 0.24$, $p > .05$, $d = .03$. However, scores did change significantly for each learning objective. For Objective 1, scores declined significantly from pre-test to post-test, $t(55) = 2.12$, $p < .05$, $d = .28$, whereas scores increased significantly for Objective 2, $t(55) = 2.12$, $p > .05$, $d = .03$. This indicates that students learned much about searching skills but not about identifying a variety of sources. Significant increases were noticed in Questions 1 and 9, and significant decreases were noted for items 2 and 5 (see Figure 1).
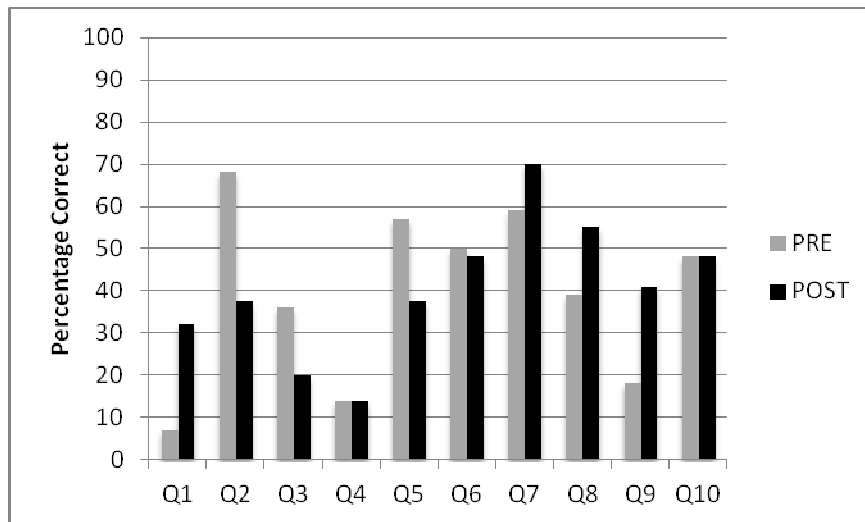
Figure 1. Percentage students responding correctly for each question on the pre-test and post-test. The conservative scoring rule was used.

To further analyze the changes in knowledge from pre-test to post-test for each item, an analysis was done to determine the numbers of students responding (a) incorrectly on both the pre-test and post-test (No No), (b) incorrectly on the pre-test but correctly on the post-test (No Yes), (c) correctly on the pre-test but incorrectly on the post-test (Yes, No), and (d) correctly on both tests (Yes, Yes). Figure 2 provides a systematic analysis of these performances for each question. It is notable that as many students changed from a correct response to an incorrect response (n = 112) as from an incorrect to a correct response ("learning"; n = 116).
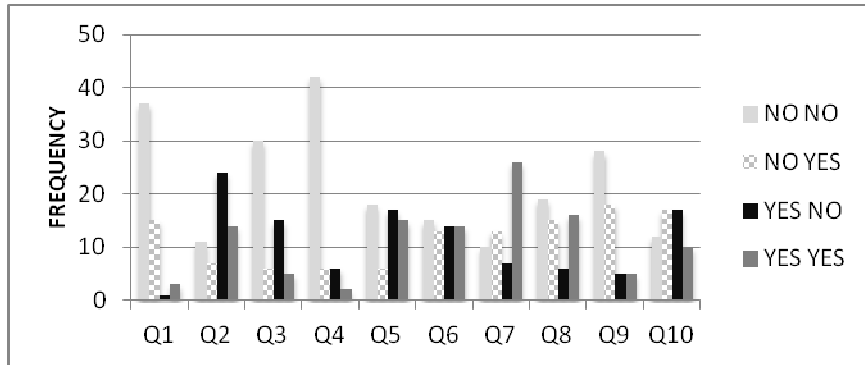
Figure 2. Patterns of performance from pre-test to post-test for each question

The values in Figure 2 provided the raw data to compute learning and retention rates for each question. Learning was defined as the percentage of students that responded incorrectly on the pre-test who responded correctly on the post-test. Retention was computed by dividing the number of students who responded correctly on both tests by the number that responded correctly on the pre-test. Figure 3 (below) shows the percentages of students who "learned" and "retained" the information for each question. Given that these are the goals for each pre-test group, the ideal is for each percentage to approach 1. Figure 4 shows the learning and retention rates for each learning objective and overall.
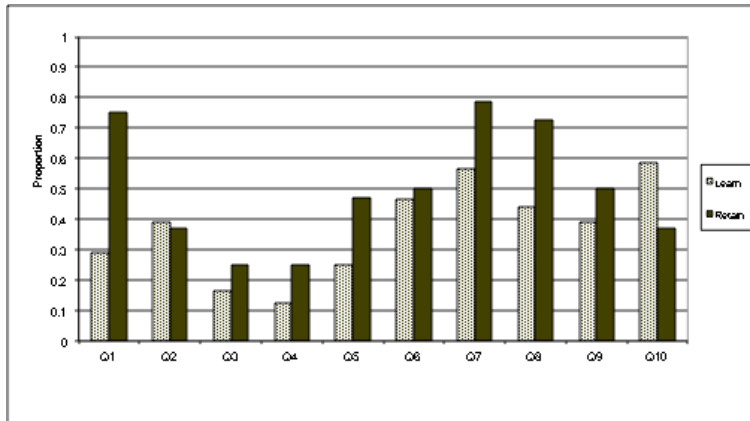

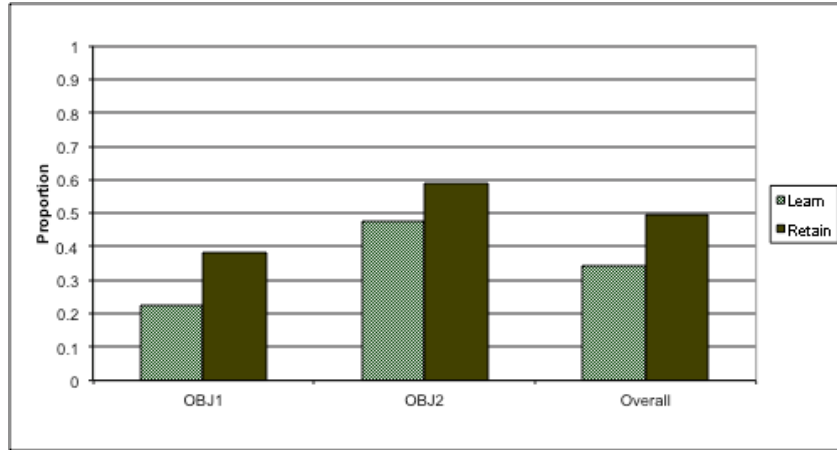*Figure 3. Learning and retention rates for each question*

Figure 4. Learning and retention rates by objective and for all 10 questions combined

Analysis

The results indicate several problem areas that students have with some basic information literacy concepts. The function of the online catalog is not well understood because 84% of students in the pre-test thought full text articles could be found by using this tool. After instruction, many students seem to confuse the journal databases with the online catalog and did not know which tool can help them find journal articles. The use of encyclopedias is not understood, and many students do not know the distinction between popular and scholarly publications. The journal holdings tool is a Rider specific device to locate full text journal articles in the subscribed databases and availability in print format. Post-test scores declined on this question, and it confirms that students have the wrong impression that such articles can be found in the online catalog. The scores on subject searching improved after changing the wording from "subject" to "subject keyword" in the pre-test. However, students still have difficulty understanding this concept. Students find it easier to know how to use the Boolean connector "and" than the "or" connector. Students improved in their understanding of the truncation feature when searching databases. Most students did not consider books for research even if it is appropriate.

Limitations

Because the specific components of research instruction depended on the nature of the course assignment, not all IL concepts in the surveys were addressed evenly or adequately in each session. It seems that some gains were canceled by other losses. Additionally, some of the pre- and post-test questions do not have equal number of correct answers and the chance responding rate is

not equal in both tests. For example, Question 8 for the pre-test required only a single response (chance = 20%), but the post-test required a multiple-response for correctness. Thus, the post-test score is most likely biased downward relative to the pre-test score. Thus, the difference between the pre-test and post-test scores maybe significant (see Figure 1).

Conclusions

The surveys revealed that many of our students don't know the purposes of different types of sources and search tools (databases vs. the catalog; books vs. journals vs. magazines, etc.). As a result of the data analyzed from these results, the Moore librarians are making a number of changes for the spring 2012 semester. First, the librarians have created a Research Guide including the common types of information sources and the purposes of each type for the 2012 spring semester. Instruction librarians have been asked to emphasize the different functions between the online catalog, databases, and Journal Holdings in their sessions. An Excel spreadsheet has been posted for librarians to mark the objectives taught in these composition classes to determine if the skills are being taught uniformly in all of these classes. If learning objectives tested are not taught during these sessions, then there might be a negative consequence on the post-tests. The chart will help determine what is being taught and the weight of the IL concepts. Secondly, two CMP-125 faculty members will ask their students to preview the Research Guides for their research instruction classes and will give a quiz (designed by the faculty) to students that will count for 10% credit. These activities are planned to occur before students come to the information literacy session. These classes will each attend a follow-up session so that the post-test can be given, and the post-tests will be compared with those classes not involved with the preview of research guide and graded quiz (control groups). It will be interesting to see if there will be a difference between these groups.

Thirdly, a performance assessment will be used in two CMP-125 classes this spring that will involve active engagement for narrowing a broad topic and using search strategies to create search terms (Boolean connectors, truncation, phrase searching). This activity will give clues to students' understanding of these objectives.

With regard to the survey instrument, the questions have been changed to keep the chance responding rates equal for all questions, and to ensure that pre- and post-test questions for the same concept have similar structures. In addition, the tests indicate the number of correct answers (two) for each question. It is important to maintain the sequence of questions covering the same concepts on both tests to facilitate the analysis of the data.

The last change for the spring 2012 semester involves the answer sheet. Instead of giving these answers to the professors, they will be handed out to students at the end of the first research instruction session. This guarantees that

the students receive this information because there was evidence that the answers were not distributed to students the prior semester.

This research will continue to investigate different teaching methods and other procedures to enhance students' information literacy proficiencies.

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