

# **Information Literacy and First Year Students: Evaluating Knowledge, Needs, and Instruction**

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## **I. Overview**

### **A. The Ethnographic Research in Illinois Academic Libraries (ERIAL) Project**

The ERIAL project is a two-year research study funded by a Library Services and Technology Act (LSTA) grant through the Illinois State Library that ethnographically examines how undergraduate students at five universities<sup>1</sup> conduct academic research and utilize library reference services and resources. The project is organized around three core goals: to gain a better understanding of undergraduates' research processes based on firsthand accounts of how they obtain, evaluate, and manage information for their assignments, to assess the role academic libraries and librarians play in these research processes, and finally, to adjust library resources and services to more effectively address students' research needs. Using a mixed-methods approach that integrates a variety of anthropological data collection techniques, this study builds a holistic and user-centered portrait of student needs through an *in situ* examination of what students actually do while completing their research assignments.

### **B. Illinois Wesleyan University**

Illinois Wesleyan University (IWU), founded in 1850, is a highly selective, private, residential, undergraduate liberal arts school of 2,100 students. IWU offers diverse curricula in liberal arts, fine arts, and professional programs, as well as opportunities for interdisciplinary study and study abroad. A liberal arts education at Illinois Wesleyan is designed to foster creativity, critical thinking, effective communication, strength of character, a spirit of inquiry, and a comprehensive worldview. 59% of IWU students are female and 41% male, with 6% international, 76% white

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<sup>1</sup> Illinois Wesleyan University, University of Illinois Springfield, University of Illinois Chicago, Northeastern Illinois University, and DePaul University. The IWU research team is composed of Andrew Asher, Lynda Duke, Monica Moore, Sue Stroyan, and Suzanne Wilson.

and 24% ALANA.<sup>2</sup> IWU has a graduation rate of 83% and a retention rate of 90% for first year students.<sup>3</sup>

### **C. Gateway Courses**

IWU requires all students to enroll in a writing course during their first year on campus, with the majority doing so in the fall semester. This “Gateway” course is a small, discussion-oriented class designed to develop students’ critical thinking and writing skills. Although not required, many Gateway instructors include library instruction sessions as part of their course content. The Ames Library, as part of its increased information literacy<sup>4</sup> efforts, would like for this component to become a mandatory part of all Gateways.

## **II. Methodology**

Because IWU’s Gateway instructors decide individually if library instruction sessions will be included in their courses, a “natural experiment” is created in which Gateway students can be divided into two groups: the students who receive instructional sessions and those who do not. In fall 2009, approximately 2/3 of Gateway instructors requested library information sessions. This study examines the learning outcomes of Gateway students using a mix of quantitative /and qualitative methods.

### **A. Information Literacy Pre-Test/Post-Test**

The IWU information literacy test was based on a modified version of the Information Competency Exam developed by the Bay Area Community Colleges Information Competency Assessment Project.<sup>5</sup> In order to fit the institutionally specific needs of the IWU study, the research team shortened the overall length of the test and made minor changes to the format and wording to some of the original test questions.<sup>6</sup> IWU’s 26-question tests were designed to be completed in approximately 20-25 minutes, and measure students’ information literacy levels in four of the five standards developed by the Association of College and Research Libraries.<sup>7</sup> In addition to the tests, the students were also asked to complete a short demographic survey.

The pre-test was administered during the first two weeks of the fall 2009 semester, while the post-test was administered during the final two weeks. In order to ensure comparability between

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<sup>2</sup> African, Latin, Asian, and Native American.

<sup>3</sup> National Center for Education Statistics--College Navigator (<http://nces.ed.gov>); for academic year 2008-2009.

<sup>4</sup> Information Literacy is the set of skills needed to effectively find, retrieve, analyze, and use information.

<sup>5</sup> See <http://www.topsy.org>.

<sup>6</sup> A copy of the IWU test instrument and documentation of the test results is available at <http://www.iwu.edu/library/erial/>.

<sup>7</sup> See <http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm#stan>. The five standards are as follows: The information literate student (1) determines the nature and extent of the information needed; (2) accesses needed information effectively and efficiently; (3) evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system; (4) uses information effectively to accomplish a specific purpose; and (5) understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally. Standard 4 was not tested, as it was deemed outside of the scope of this study.

the tests, both tests used the same questions. However, the order of the questions was changed between the pre-test and post-test to minimize the chance that students would remember particular questions or their previous answers. Given the elapsed time between the tests, and the fact that the tests were not used as part of course instruction, we believe the effect of using duplicate questions was minimal.

The participation of Gateway courses in the information literacy study was at the discretion of the individual course instructor. Participation by the students was also voluntary. The course instructors were not given copies of the tests or the results of either test until after the semester was complete. In total, 21 classes participated in the pre- and post-tests, representing roughly 2/3 of the 32 Gateway courses offered during the fall 2009 semester. Of these, 15 classes participated in library information sessions. 273 students participated in the pre-test, and 272 in the post-test, representing about 53% of IWU's 2009-2010 freshman enrollment.

### Research Process Interviews

In order to more fully contextualize the quantitative component of this study, the Gateway students who participated in the information literacy tests were also asked to participate in two qualitative interviews, the "research process interview," and the "retrospective research interview." In the first method, students demonstrated how they gathered information for a research assignment while accompanied by the study's ethnographer, who asked the student to explain aloud their search process and documented the search on video. 19 students participated in the research process interviews, with each interview lasting approximately 30-45 minutes. In the second method, students were asked to describe the step-by-step process they undertook while completing a research assignment and to document the process by drawing each step on a large sheet of paper. The data collection and analysis for these "retrospective research interviews" is currently still in process, and the results from this method will not be addressed in this presentation.

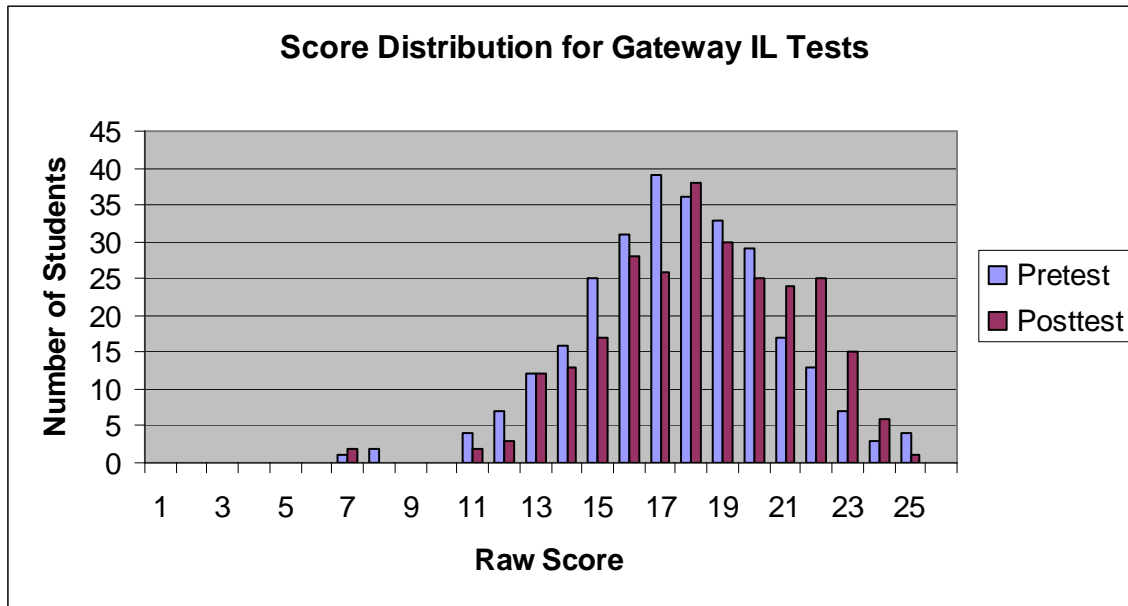
## III. Findings

### A. Pre-/Post Test Findings

The mean score on the pre-test was 17.64 (67.8%), compared to 18.36 (70.6%) on the post-test. While this small improvement is statistically significant (at  $p < .05$ ), its effect size is extremely small ( $\eta^2 = .014$ ), suggesting that there is no meaningful difference between the average scores on the two tests. Furthermore, the test results showed no significant variation by gender, ethnicity, major, or the number of library information sessions the student attended during the semester.

Average Raw Score on the Information Literacy Pre-test/Post-Test			
Test	Mean	N	Std. Deviation
Pre-test	17.64	263	3.071
Post-Test	18.36	262	3.036

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Post-Test	18.36	262	3.036
Total	18.00	525	3.072



Despite the clear difficulties with basic information literacy that these scores suggest, for the most part, students believed their skills were slightly above average. When asked to rate their own skill in locating and evaluating information on a scale from 0-10,<sup>8</sup> the majority of students rated themselves between 6 and 8 in both categories on both tests.<sup>9</sup> Students were especially confident in their abilities to locate information on the post-test, with 81% rating themselves at 6 or better. These self-ratings were not, however, correlated with students' scores on either test.

<sup>8</sup> The questions were presented as follows:

On a scale of 0 to 10, with zero being poor and ten being excellent, how would you rate your library research skills in terms of being able to locate information? Circle your response:

0      1      2      3      4      5      6      7      8      9      10

On a scale of 0 to 10, with zero being poor and ten being excellent, how would you rate your library research skills in terms of being able to evaluate information? Circle your response:

0      1      2      3      4      5      6      7      8      9      10

<sup>9</sup> On the pretest, 65% rated themselves between 6 and 8 in their ability to locate information, while 64.5% rated themselves between 6 and 8 in their ability to evaluate information. On the post-test, these percentages increased to 73.3% and 68.8% respectively.

Students' Self Rating of Information Literacy Abilities				
Test	Ability to Locate Information		Ability to Evaluate Information	
	Mean	Std. dev.	Mean	Std. dev
Pre-Test	6.09	1.592	6.63	1.611
Post-Test	6.75	1.514	7.17	1.558

While students' overall performance on the information literacy tests was for the most part lackluster, students consistently performed more poorly on questions addressing ACRL Standards 2 and 5, which evaluate, respectively, students' ability to appropriately and effectively access information, and students' understanding of the legal and ethical issues of information use.

ACRL Standard	Pre-Test		Post-Test	
	Mean Score	Percent Correct	Mean Score	Percent Correct
1	4.5/6	75.7%	4.7/6	78.8%
2	5.3/9	59.2%	5.6/9	61.7%
3	3.9/5	78.9%	4.1/5	82.1%
5	3.8/6	63.7%	4.0/6	66.0%

Taken together, these results imply two possible conclusions: either the student's information literacy skills did not significantly improve over the course of their first college semester, or the information literacy tests (and in particular the post-test) do not accurately measure improvements in students' learning outcomes. In terms of Standard 2 (accessing information), it appears that written tests are not the best method for understanding students' abilities to search and find sources. For Standard 5 (ethical use of information), librarians have limited time with students (typically only one class session, and occasionally two or three), necessitating an assignment-based focus in the sessions which often does not include specifically addressing copyright and ethical issues. Although students performed reasonably well on Standard 3 (evaluating sources), and rated themselves highly in this area, after viewing the videos of student's research process interviews (discussed below), it nevertheless appears that they are not actually utilizing proper evaluation techniques in practice.

A question by question analysis of students' responses suggests several patterns in students' information literacy deficiencies:

- Students are unable to correctly read citations and identify the type of source referenced. Furthermore, students do not exhibit an adequate understanding of why it is important to cite information, or when a citation is required. Of the four questions in the information

literacy tests that asked students to identify the type of source identified by a given citation, 42% of students answered 0 or 1 question correctly on the pre-test, compared to 37% on the post-test. Only 9.5% of students answered all four questions correctly on the pre-test and only 14.5% on the post-test.

- Students do not fully understand issues surrounding the ethical use of information, especially with respect to the meaning and implications of copyright protection, and the practical actions required to correctly observe copyright law.
- Students exhibit difficulty in evaluating sources of information, and are particularly confused about the differences between primary and secondary sources.
- Students do not adequately understand how information resources are organized, both in the library and elsewhere (e.g. on the internet). For example, students exhibit difficulties understanding the difference between the library's catalog and on-line databases, the types of resources that can be found using these tools, and the differences between library subject-specific databases.

Based on this pre-test/post-test experience, it appears very difficult to write a quantitative assessment tool that accurately measures students' learning outcomes over the course of a semester, and whether or not they have acquired the ability to apply information literacy concepts within real-world settings, rather than simply being able to select the best response on a multiple choice question.

## **B. Research Process Findings**

During the 19 research process interviews conducted for this study, the research team observed 70 unique searches.<sup>10</sup> 60 of these searches were for unknown items (e.g. when a student was attempting to discover sources related to a research question, rather than a specific book title or journal article).

These interviews provided more details and, in conjunction with the pre/post test results, a much more nuanced insight into students' research processes and information literacy levels. After reviewing and coding the videos of the research process interviews, only 3 out of 19 students conducted what a librarian might consider a reasonably well-executed search. 48 specific problems were identified, which can be grouped into the following six areas:

- **Selection of database:** Using an inappropriate or less useful database was common. Of the 19 interviews, 8 students searched in databases that a librarian would most likely never recommend for their topic. In addition, students who have not had a library instruction session exhibited substantial difficulty finding their way to any library database, let alone the best one for a topic. For example, one student tried the following areas on the library's website while looking for a journal article: ILLiad (used to request

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<sup>10</sup> For the purposes of our analysis, we defined a search as anytime a student opened a new resource to search for information. If the student changed their search terms within a resource, we did not count this as a new search. Therefore, we observed 70 searches encompassing 117 separate sets of search terms.

journal articles not owned by IWU), Digital Commons (institutional repository), Citation Linker (used to locate journal titles owned by the library), I-Share catalog (used to request books from other Illinois libraries) and Google, where she finally gave up without locating an article.

- **Search strategy:** Students treated all search boxes as the equivalent of a Google search box. Of the 19 students, 16 conducted searches using “any word anywhere”, “all fields,” or an equivalent default search when it was not appropriate to do so. In total, 101 of the 117 observed sets of search terms used this approach.
- **Citations:** An inability to accurately read citations lead to difficulty finding a specific source and/or selecting appropriate sources.
- **Evaluation:** Evaluation of potential sources appeared cursory. Students would make rapid assessments of whether or not a source was useful or appropriate, usually based only on the title of an article or book, or sometimes by reading the abstract. Rarely did a student actually look at the subject headings or keywords associated with the document, read the text itself, or locate the book to review the table of contents. Students also did not review citations past the first or second page of their results.
- **Locating physical items:** Students often have difficulty locating books in the library stacks. When students sought help for locating a book at one of the three service points (all of which are staffed by student assistants) they were often given incomplete or incorrect information.
- **Technical:** Students encountered a variety of technical issues (e.g. dead links in the databases, slow databases, and incomplete information in an ILLiad request form) during their searches. This often resulted in the student abandoning the source in question and beginning a search for different items. In general, students were very quick to give up on finding a source, so much so, that almost any obstacle they encountered would cause them to move on to another source or to change their research topic.

Further observations include:

- Although the majority of the students struggled with finding the correct database to use, their search terms, locating a known item, and/or technical problems, not one student sought the assistance of a librarian. However, students did ask for help at one of the three service points (all of which are staffed by student assistants) when they encountered difficulty finding a book in the stacks or a jammed printer.
- In general, students appear to have a very strong preference for selecting sources that are available online in full-text. This often leads to a student ignoring a potentially appropriate source, simply because it is not readily available.
- Conducting a successful search for scholarly sources is a complex process that requires numerous steps and considerable knowledge of the discipline and its particular jargon.

Moreover, it is critical for students to understand how information is organized, how to evaluate sources, and how to use the “tools” of scholarship – online catalogs, databases, the Library of Congress Subject Headings, etc. If a student lacks sufficient knowledge in any one of these steps, the quality of their search results, and subsequently the sources on which they base their research, can be significantly diminished. For example, one student, while searching library databases for information about women in baseball, lamented the dearth of information on this topic and was seriously considering changing topics – all while her mouse was hovering over the subject heading “All-American girls professional baseball league”.

- Almost without exception, students exhibited a lack of understanding of search logic, how to build a search to narrow/expand results, how to use subject headings, and how various search engines (including Google) organize and display results. As one student mentioned, while conducting a search of library databases “Apparently you don’t have much on Rock and Roll”, obviously not realizing if she changed her search term (i.e. to rock music), she would have encountered excellent sources for her assignment.
- Students exhibit a lack of understanding of where the border is located between library resources and internet resources. For example, when a student is instructed by a professor to find “non-internet sources,” students are often unsure if the library databases, which are accessed via the internet, constitute appropriate sources. Likewise, if a student accesses library resources via Google scholar, they are often unaware that these are, in fact, made available through the library.
- Students who had participated in instruction sessions clearly knew more than those who had not done so. These students were better at locating databases, changing keywords, and using more of the library’s tools. As one student noted, the librarian “...gives us the most effective sources to use.” However, they often did not remember some basic or specific concepts, or apply them correctly.
- Students gave up on a search or changed a topic very easily. They also often searched to meet minimum expectations (e.g. three articles), not necessarily to find the most useful sources.

#### **IV. Conclusions and Next Steps**

As reliance on information becomes more pronounced in our society and information easier to produce and disseminate on the internet, it is increasingly important for students to know how to access, evaluate and use information effectively and ethically. The first year of college is a particularly critical period for the acquisition and development of information literacy and research skills. Exposure to these skills early on enables students to gain proficiency over time and to graduate with the skills necessary to conduct high-quality research in graduate school, their chosen profession, and in their personal lives. Although students appear to be “getting by” and finding sources, the results of this study indicate a lack of overall understanding of information literacy concepts and how to successfully apply them in their research. In short,

students find information to read and cite for their assignments, but miss opportunities to enhance their learning and exercise their critical thinking skills.

Creating critical thinkers is one of the primary goals of the university's mission. While IWU has identified the first-year Gateway courses as a curricular location in which to focus on developing students' critical thinking skills, there are presently no uniform guidelines on the role library research and library instruction should play in this process. Information literacy must be seen as a component of this goal. As such, the concepts of information literacy should be woven through the curriculum – not just in the first year, but throughout the life of a student.

While the results of this study point to serious and persistent gaps in students' information literacy skills, we nevertheless believe that the demands of university-level writing courses are forcing first-year students to improve -- at least to a level that enables them to perform adequately on their research assignments. Throughout the ERIAL study, the IWU research team has consistently observed that students tend to be very assignment and task driven, and oriented only to meeting the minimum requirements of specific assignments (e.g. a specific type and number of sources, page length, etc.). One conclusion that might therefore be drawn from these test results is that students are learning what they need to complete one assignment, but not carrying over any of these skills into a more generalized understanding of research methodology, information literacy skills, or the knowledge base they use for subsequent assignments.

As the data from this study continues to be analyzed, the research team will develop recommendations for improvements to the instructional curriculum of both the library and Gateway courses. If, as library faculty believe, including library instruction sessions is beneficial for students, making these sessions mandatory for all Gateway classes could enhance the first-year experience for our students. Moreover, the findings will help library faculty to better target their information sessions on information literacy skills that seem to be particularly lacking in new students.

The following curricular considerations are presently under discussion by librarians:

- Incorporating more hands-on activities within library instruction in order to more directly address the practical problems students are having with the various library search interfaces, and to demonstrate strategies for building an effective search.
- Making information literacy a mandatory part of Gateway instruction (e.g. how to read a citation, importance of citing, ethical uses of information, research mechanics, methodological issues).
- Requiring all Gateway students to take an information literacy pre-test at the beginning of the academic year to provide baseline information about what students know (especially for skills that are easily measured--e.g. copyright information, identifying plagiarism, etc.). Specific skills where students are deficient can then be targeted by librarians in information sessions and by faculty in course instruction.

- Restructuring Gateway research assignments in a more “scaffolded” format. The research team has observed that students who have been given assignments that break up the research processes into multiple steps (e.g. creating an annotated bibliography, critically evaluating a resources, writing a thesis statement and abstract, etc.) that are individually evaluated by the course instructor are more successful in obtaining and utilizing high quality sources.

As a direct result of this study, the first of these recommendations--refining library instruction--is already underway. The second and third points under discussion would involve significant changes to the curriculum, and will therefore involve bringing the ideas to the IWU faculty for further discussion and implementation. The final point, re-thinking how assignments are constructed, can potentially be accomplished by strengthening ties with individual teaching faculty.

Finally, because of the complex processes involved in information literacy acquisition, and the diverse array of problems this study has observed in students’ research practices, the problem of how to best measure the impact of library instruction continues to be a central issue for this study. As an assessment tool, the information literacy test appears to be most effective for providing baseline data of students’ knowledge than as a tool for making post-instruction comparisons (at least within IWU’s instructional environment). By contrast, the qualitative interviews provided a rich source of data for holistically understanding first-year students’ research processes and practices, as well as a fine-grained tool for analyzing the obstacles students encounter when completing actual research assignments. For this reason, the development of a standardized qualitative interviewing method that could be used to make longitudinal comparisons of student’s information literacy skills might represent a highly effective approach to assessment. In a future study, we hope to implement this approach by giving incoming students an information literacy test at the beginning of the academic year, and then periodically interviewing a group of students throughout their first year in order to gain a better understanding of these students’ processes of information literacy acquisition.