Statistics & the Single Girl: Incorporating Statistical Literacy into Information Literacy Instruction

Katharin Peter, USC and Lynda Kellam, University of North Carolina at Greensboro

In recent years, more academic libraries have increased their support of advanced researchers by managing, curating, and collecting numeric datasets. However, there is also a need for libraries to support novice and less-advanced users--that is, those with numeric research questions who may not have the technical skills or statistical knowledge needed to analyze a dataset. Libraries are uniquely positioned to help these novice researchers discover, access, and evaluate ready-made statistics, just as we help them discover, access, and evaluate other types of information. No longer solely the purview of data, government information, and business librarians, this support can and should be mainstreamed into wider library reference and instruction initiatives. By doing so, we can expand the library's role in supporting university-wide efforts to improve information literacy and critical thinking skills to include support for statistical literacy and quantitative reasoning. This article will address how subject specialists and general instruction librarians can integrate numeric information (in the form of statistics) into library instruction sessions and information literacy programs. In this context, *data* refers to numeric datasets which typically require analysis using statistical or spreadsheet software and *statistics* refers to compiled or summarized data.

Statistical Literacy

At the undergraduate level, statistical literacy is an important component of university-wide efforts to create critical thinkers who can evaluate and interpret information, conduct original research, and effectively communicate findings. At the graduate level and in the professional disciplines, statistically literate researchers must identify and evaluate evidence-based research and engage in evidence-based decision making, such as for health or public policy. For librarians, statistical literacy is an element of wider information literacy initiatives, applying the same principles and practices to a specific type of information (i.e., numeric). In a 2004 article, Gray provides several arguments for why data and statistical literacy are relevant to librarians including the important role of data and statistics in research and society as well as the presence of numeric information within library collections (e. g., statistical publications, statistical databases, and datasets).

Generally, statistical literacy can be viewed as the ability to interpret and evaluate statistics--in this case, referring to basic descriptive statistics such as the number of unemployed veterans, the rate of inflation, or the percentage of adults who favor gun control. The competencies of statistical literacy can be viewed as a continuum of skills, ranging from understanding basic statistical terms, such as *percent-*

age and *average*, to more advanced statistical methods and analyses. While it is not the role of the library to teach statistics or statistical concepts, librarians can help users locate relevant, quality statistics and challenge users to think critically about the content.

Integrating Statistical Literacy into Information Literacy Instruction

The principles of statistical literacy can and should be integrated into library information literacy instruction. Imagine you have been asked to prepare an instruction session for a freshmen-level, general education course in which students are expected to develop a persuasive speech on a current political topic such as same-sex marriage or immigration reform. Following the information literacy program learning outcomes in place at your library, you have decided to cover the best approaches for locating and then evaluating different types of information students might use in their speeches according to authority, accuracy, currency, relevancy, and purpose. As part of the session, you have students find and compare websites, newspaper articles, journal articles, and books according to guidelines you have presented. Statistical information, in this case public opinion statistics, can be easily and effectively incorporated into this type of session by tailoring the sample classroom activity below to fit the scope of the assignment and class time available.

Sample Classroom Activity: Evaluating Public Opinion Statistics

The following activity walks students through the steps of evaluating statistical information using two readily-available sources of public opinion statistics. A public opinion poll is conducted by interviewing a random sample of people on their opinions, beliefs, or behaviors. Reliable public opinion statistics provide non-biased measures of the public's views. This activity can be completed in 20 minutes or truncated to about 10 minutes by eliminating steps 2, 3, and 4 and using alternate activity suggestions provided below.

Step 1: Criteria for Evaluating Statistics

For the first step of the activity, you will provide students criteria for evaluating statistical information and have them apply these criteria to statistical graphics from the popular press using *USA TODAY Snapshot*s. *USA TODAY Snapshots* is a section of the *USA TODAY* website that includes simple, eye-catching graphics created from a variety of data sources including governmental statistics, commer-

cial sources, and public opinion polls (http://usatoday30.usatoday.com/news/snapshot.htm). Have students choose one or two "snapshots" to evaluate. Using the following guidelines and sample questions, apply the same approach you use in instructing students to evaluate non-statistical information[1]. Have students investigate:

- **Authority**: Who is the author and/or who created the chart, graph, or figure? What are their qualifications?

- **Audience**: Who is the intended audience?

- **Content**: What is being communicated by the statistics or statistical presentation? Do the statistics "make sense" logically? That is, do they seem reasonable or are there other factors that might better explain or contribute to the findings? For polling statistics, how were the questions worded? Did they include loaded terms? How are the statistics presented? Does the presentation accurately represent the statistics? Are they presented in a neutral fashion?

- **Coverage**: Who (or what) is being represented by the statistics? For example, do the statistics represent everyone in the United States or just registered voters, adults, or another subpopulation?

- **Currency**: When were the statistics collected? What time period(s) do they represent? Were events occurring at the same time that may have influenced the responses or outcomes? Is more recent data available?

- **Purpose**: Why were the statistics collected? If it is from a public opinion poll, who sponsored or paid for the survey?

This part of the activity can be done either as a whole class or, if time allows, in small groups. Typically students can easily identify problems with the presentation of the information (e.g., if the graph makes sense or is misleading in some way) and often they will catch issues such as the bias of the data source (e.g., loaded question wording). Students will not be able to answer all of the questions based on the information provided on the *USA TODAY Snapshots* webpage but should be encouraged to ask these evaluative questions. Conclude this step of the activity by asking the class if they think the statistics from these infographics are appropriate for use in their speeches or other university assignments.

Step 2: Recap

This optional step in the activity is intended to recap lessons learned in Step 1. Play a short clip from *The Colbert Report* in which Stephen Colbert humorously evaluates an infographic to reinforce the importance of the author, content, and purpose criteria (2011).

Step 3: Applying What Was Learned

The next step of the activity introduces students to the Pew Research Center (http://www.pewresearch.org/), a non-partisan source of current, high-quality, demographic and public opinion statistics. The Center's research projects cover a variety of topics including U.S. politics, media, social trends, religion, internet, and technology in addition to a Hispanic Center and a Global Attitudes Project. For this activity, direct students to the *Topics* page accessible from the navigation bar on the Center homepage, a good gateway for students looking to find reports containing statistics on their speech topics. Select one of the topics listed to pull up a list of recent reports.

For example, under the topic *Gay Marriage and Homosexuality*, see the "Public Divided over Same-Sex Marriage Rulings" report from July 1, 2013 (Pew Research Center). Chose a figure from this (or another report) and have students apply the criteria from the guidelines used in Step 1. To save time, this can also be done as a group discussion. Students should be able to answer most of the questions from the information provided in the selected figure, from the surrounding text, or by opening the complete report. Conclude this step of the activity by asking students how this source compares to *USA TODAY Snapshots* and if they think the statistics from the Pew Research Center are appropriate for use in their speeches and other university assignments.

Step 4: Finding Reliable Public Opinion Statistics

Conclude the activity by providing students with additional sources for locating reliable statistics they can include in their speeches. Many university libraries subscribe to one or more of the following sources of public opinion statistics: Roper Center, Gallup Brain, and Polling the Nations (to name a few). For a curated list of public opinion and other statistical sources you may want to add to your teaching arsenal, see the *Compendium of Sources* tab on the Data on the Run workshop companion guide (http://libguides.usc.edu/dataontherun) or search the LibGuides Community website by topic (e.g., "religion statistics") for more librarian-created guides (https://libguides.com/community.php).

Having students evaluate numeric information in the same manner as other types of information is a great way to assess how well they can apply information literacy skills across different types of information. This generalizability is a fundamental dimension of information literacy that often gets lost in discussions of format. The sample activity presented here could be tailored to a variety of assignments from freshmen-level persuasive speeches to upper-level research papers and easily adapted across disciplines or for classes without assignments.

The Big Picture: Statistical Literacy as an Information Literacy Competency

Many instruction librarians create student learning outcomes (SLOs) geared to the research skills students need in order to complete their class assignments. SLOs should be written to emphasize goals for student learning. One approach for creating attainable and measurable SLOs for an information literacy session is to complete the following sentence: *At the end of the instruction session students will be able to...* For example, a SLO for a general information literacy session might be *Generate keywords that retrieve relevant information for their research question.* For the sample activity presented here, we might identify two SLOs:

1. Evaluate statistics found in the popular press according to authority, audience, content, coverage, currency, and purpose.

2. Identify at least once source of reliable public opinion statistics.

Typically in university-level library instruction, SLOs align with the Association of College and Research Libraries' (ACRL) Information Literacy Competency Standards for Higher Education. These competencies emphasize a student's ability to find, evaluate, and use information properly (ACRL, 2000). While all of these competencies can be applied to statistics as a type of information, several specifically address components of statistical literacy:

1.2c: Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)

1.2f: Realizes that information may need to be constructed with raw data from primary sources

2.3d: Uses surveys, letters, interviews, and other forms of inquiry to retrieve primary information

3.1b: Restates textual concepts in his/her own words and selects data accurately

3.4e: Determines probable accuracy by questioning the source of the data, the limitations of the information gathering tools or strategies, and the reasonableness of the conclusions

5.2e: Legally obtains, stores, and disseminates text, data, images, or sounds

In addition to these general competencies, sections of ACRL have created subject-specific guidelines that align with the broader ACRL standards, several of which explicitly address components of statistical literacy (ACRL 2006, ACRL 2008a, ACRL 2008b, and ACRL 2011). These guidelines are great tools for brainstorming approaches to incorporating statistical literacy into your classes and, in some cases, provide examples of in-class activities[2].

If your library has developed general SLOs for your instruction program, we encourage you to consider including statistics-related learning outcomes. Integrating statistical literacy principles into your general learning outcomes is a great way to encourage the mainstreaming of statistical literacy across the library. Further, by developing SLOs as a group, you can better draw on the knowledge of your team members to create more innovative and relevant learning activities. Statistical literacy can be easily incorporated into many instruction sessions by many types of librarians. We hope this article will encourage you to give it a try!

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Footnotes

1 These guidelines revise ones presented in Kellam & Peter (2011, p. 101-2).

2 Currently, there are few articles that discuss statistical literacy as a component of information literacy. Some has been written, however, on data literacy. For example, Calzada-Prado & Marzal (2013) mapped data literacy competencies to general ACRL standards and subject-specific guidelines.