CHAPTER 19*

Teaching with Data

Visualization and Information as a Critical Process

Andrew Battista and Jill Conte

Introduction

Our lesson plan is for a first-year writing class that studied ethnographies of race, gender, and desire in the context of twenty-first-century global culture. Students were asked to write a researched essay that incorporates data alongside other evidence, and their essays were to adopt the genre of Gloria Anzaldúa's *autohistoria*, a personal, mixed-form exploration that disrupts social hierarchies.¹ In collaboration with the instructor, we developed a multi-class sequence that helped students discover data and integrate it into their writing. In our sessions, we recognized that working with data is difficult. Often, data is not ready to manipulate as it comes to us, in its “out of the box,” downloadable form. For example, government agencies, nonprofits, and proprietary vendors often provide spreadsheets that have unclear column headings. Such data are accompanied by complex codebooks and require some effort to understand the methods of their collection or the way to format them that are amenable to visualization.²

Despite these difficulties, data are typically treated as a superior form of evidence. We live in a data-saturated moment, in which maps, infographics, and charts distill complex realities into seemingly palpable truths. As a culture, we have an overweening confidence in the power of metrics to guide

* This work is licensed under the Creative Commons Attribution License 4.0 (CC-BY 4.0).

us through the world, yet such “raw data” often obfuscates complexity. Lisa Gitelman and Virginia Jackson suggest that the idea of “raw data” arises from the “unnoticed assumption that all data are transparent” and indeed are “the fundamental stuff of truth itself.”³ Similarly, in her recent book *Beautiful Data*, Orit Halpern identifies an “unquestioned assumption that data presents stability, wealth, and sensorial pleasure, a panacea to economic, social, political, and ecological problems [and] a new resource to extract in a world increasingly understood as resource constrained.”⁴ This conception denies that data production is a culturally constructed process, emerging from historical and political contexts, which reveals some things while obscuring others. These misconceptions necessitate that teachers invite students to pose critical questions about data and the rhetorical uses to which they are put. Rather than treating data discovery as a technical process, our class emphasized the critical stance with which one should approach data. With this lesson plan, we show how librarians can emphasize critical data literacy while teaching students to identify, locate, download, clean, interpret, and visualize data.

Learning Outcomes

- Identify and locate sources of data in order to incorporate empirically based visualizations into research essays
- Articulate critical questions about the construction and application of data in order to provide appropriate context for the way data are used as a rhetorical device
- Cultivate the ability to seek out additional documentation that contextualizes the production of data in order to visualize and write with integrity and accuracy
- Recognize that identifying, locating, downloading, cleaning, and visualizing data is an iterative process
- Produce data visualizations with explanatory context to advance an argument

Materials

- LibGuide housing sample visualizations, sample data extracts, a list of recommended library resources that include data sources, and a video about the process of peer review⁵
- PowerPoint presentation providing an introduction to information, data, and cartographic literacies
- Worksheet outlining a guided process of discovering, evaluating, and visualizing data⁶

Preparation

To develop an instruction session, choose a social justice issue that has clear implications for the politics of gender, race, class, sexuality, or geography. Ideally, that issue would also be fodder for compelling data visualizations. Then, create multiple visualizations as teaching tools, with the aim of having each serve as an occasion for students to think critically about the data before them. For example, we chose to focus our session on rape statistics because they touch on many political dimensions and allow for the creation of various maps. To start, we found a map on CNN.com that highlights where rape is most common in the United States.⁷ Then, we created alternate visualizations based on the same source data: the Uniform Crime Reports released by the Federal Bureau of Investigation (FBI).⁸ Our images mapped different representations of the data and used different scales, color schemes, and time frames.

Embed interactive visualizations online so that students can explore, view source data, and discover the tools that were used to generate them. We created a LibGuide to display our sample visualizations alongside the CNN.com image and included a link to the source data as a Google spreadsheet for transparency. We also used the LibGuide to create a list of relevant library resources—including links to literature databases, data sources, and visualization tools—to help students find materials for their own research projects.

In the first session, formulate several critical questions for students to ponder while they view and interact with the prepared visualizations. Use these specific questions to segue into instruction on the fundamentals of information literacy. In addition to the LibGuide, we created a PowerPoint presentation to help structure the class and organize the flow of information to students. To develop their data and cartographic literacies, the presentation included a set of reflection questions to consider while engaging with the maps we created. The remainder of the presentation was focused on developing basic information and data literacies and providing a foundation for how to use the library.

For the second of the two sessions, develop materials that guide students through the process of creating their own visualizations. We prepared a worksheet, cited previously, that walked students through the following processes:

- Brainstorming a research topic
- Identifying and locating relevant data
- Evaluating the quality of those data
- Manipulating and visualizing those data

Session Instructions

1. Focus on cartographic literacy to start. We opened our class with an image of Uruguayan artist Joaquín Torres-García's famous work, "América Invertida," which depicts an upside-down map of South America. We asked the students to reflect on this image as we read aloud a passage from Torres-García's manifesto, "The School of the South," which argues that the convention of placing North above South is not "natural" but a purposeful reflection and reification of global power relations.⁹ This image encouraged students to think critically about maps and their construction as cultural and historical objects.
2. Introduce the prepared visualizations as a warm-up exercise for thinking critically about data and data visualizations. We showed the CNN.com map of rape reports by state followed by the alternative maps we had prepared with the same data. We asked students to consider the following as they viewed these images:
 - Who made the map?
 - For what purpose was the map designed, and for whom was it made?
 - From where were the data sourced?
 - What information is included in the map; what is missing?¹⁰
3. After giving students time to investigate the maps, ask them to discuss their observations as a group. In our session, students quickly posed some important insights: How many incidents of rape were never reported? What is the definition of rape, and how is this definition constructed by the FBI? Why do rural states, such as Alaska and South Dakota, have such high rates of rape? Conversely, why do certain states on the coasts, such as New York and California, have such low rates? To what degree is rape a reflection of other social problems that are not (or cannot be) reflected on maps? Is a spatial visualization of this social phenomenon helpful or harmful?
4. As for cultural questions, model ways in which students can and should push the evidence. For instance, we discussed how shifting social understandings and legal definitions of rape over time and across state jurisdictions may impact the collection and interpretation of rape statistics nationally.* Even though we provided a starting place, students still pointed to the seams of the definition on their own by asking these questions:

* Even though the data we culled reached back to the 1980s, the FBI revised its definition in 2013 to consider a much broader range of violations than what had preceded it. See Federal Bureau of Investigation, *Reporting Rape in 2013* (Washington, D.C.: Federal Bureau of Investigation, April 9, 2014), <https://www.fbi.gov/about-us/cjis/ucr/recent-program-updates/reporting-rape-in-2013-revised>.

What would prevent someone from reporting a rape? How many of these rape allegations resulted in arrests, were tried in court, and led to convictions? What cultural attitudes about gender and aggression would inflect the ways these data are collected and presented? The discussion that emerged from the sample dataset proved to be foundational as a frame for students to develop an autoethnographic approach to their essays. That is, as Mary Louise Pratt has noted, it was instrumental as they endeavored “to describe themselves in ways that engage with representations others have made of them” as a form of critique and resistance.¹¹

5. After developing a list of working questions, transition to teaching information literacy basics. We framed our instruction around the threshold concept, “scholarship as conversation.”¹² Introduce students to key resources for finding background information and original research on their topics. Demonstrate how to find and evaluate data by examining several open and proprietary databases that provide access to data. For example, Data-Planet, OECD, UNStats, and others allow people to isolate indicators across multiple years and extract tabular data for use in third-party visualization platforms. Be sure to emphasize the importance of leveraging the metadata provided by these tools to trace data back to their source and to discover additional documentation.
6. Unlike the first session, which is designed as a mix of didactic and discussion-based teaching, the second session is more of a free-form workshop that incorporates hands-on learning and addresses the specific research needs of individual students. It is acceptable, however, to impose a certain degree of structure, for example, by distributing a guided worksheet. In our session, the worksheet helped to focus students who were working on their own as we circulated the room and provided individual assistance to students as they ventured to articulate their research topics, find literature, locate data, and create visualizations.

Assessment

We recommend collecting the worksheets from the second session and using those to evaluate students’ ability to identify, locate, download, clean, and visualize data for their research projects. It is also important to observe the progress of students during the one-on-one time with each of them during the second session, when many have already begun to engage in the beginning stages of their data analysis. Likewise, the discussion portion of the first session, which reveals the breadth and depth of students’ critical thought processes, has similar potential for gauging extemporaneously the success of certain learning outcomes. For those who seek to recreate or modify this lesson plan,

we also recommend asking the faculty member to share the students' final essays and visualizations as means to assess the instruction sequence.

Reflections

A number of students appeared noticeably confounded by the opening image and reading of Joaquín Torres-García's work. Such an unorthodox notion—the idea that the direction of a map's compass is socially and culturally determined, that one person's perspective as upside down could be another person's right side up—had clearly never crossed some of their minds (as it had never crossed ours at one point either). Watching them process and absorb that radical thought for the first time was gratifying.

With that said, the original lesson plan may have tried to cover too much ground in the time allotted. We weren't sure that students were able to find appropriate data and create visualizations effectively—in addition to mastering basic information literacy skills—in two sessions. Retrospectively, we would have focused more on having the students operationalize concepts, identify and find specific variables, and express them in terms that could be translated into their essays. Furthermore, we would have addressed in greater depth the process of having students integrate data as a form of evidence into their prose.

Final Questions

As we prepared our class and composed this lesson plan, we kept asking questions about the example dataset we chose. Rape is a political subject, but for many people, it is an issue with which they have personal experience. What are the ramifications of selecting a topic that could potentially elicit traumatic feelings for students or faculty? Do we as instructors have a responsibility to preface our teaching with trigger warnings, especially if we plan to introduce potentially sensitive materials? How do we find the balance between creating a safe space for people while also tackling important political discussions that are pivotal to a critical, socially conscious learning experience?

* The discussion of trigger warnings in teaching contexts is beyond the scope of this lesson plan, but we mention it here because we believe that the discussion itself is important and worth having. For critiques of the use of trigger warnings, see Laurie Essig, "Trigger Warnings Trigger Me," *Chronicle of Higher Education*, March 10, 2014, <http://chronicle.com/blogs/conversation/2014/03/10/trigger-warnings-trigger-me>; Jack Halberstam, "You are Triggering Me! The Neo-Liberal Rhetoric of Harm, Danger and Trauma," *Bully Bloggers* (blog), July 5, 2014, <https://bullybloggers.wordpress.com/2014/07/05/you-are-triggering-me-the-neo-liberal-rhetoric-of-harm-danger-and-trauma>.

Notes

1. Gloria Anzaldúa, *Borderlands/La Frontera* (San Francisco: Aunt Lute, 1987).
2. Ryan Womack, "Data Visualization and Information Literacy," *IASSIST Quarterly* 38, no. 1 (2014): 12–17. Womack suggests that these difficulties should lead the profession to develop an approach to data visualization as a subset of information literacy.
3. Lisa Gitelman and Virginia Jackson, "Introduction," in *"Raw Data" Is an Oxymoron*, ed. Lisa Gitelman (Cambridge, MA: MIT Press, 2013), 2.
4. Orit Halpern, *Beautiful Data* (Durham, NC: Duke University Press, 2014), 5; See also Justin Joque, "From Data to the Creation of Meaning Part 1: Unit of Analysis as an Epistemological Problem," *IASSIST Quarterly* 38, no. 2 (2014): 7–11.
5. Jill Conte and Andrew Battista, "Gender & Sexuality Studies: WRII-UF 102: Ethnographies of Race, Gender, and Desire," NYU Libraries research guide, last modified July 22, 2015, <http://guides.nyu.edu/WRII-UF102>. The files for our extracted dataset and class worksheet are also linked on this guide.
6. Andrew Battista and Jill Conte, "Worksheet for WRII-UF 102: Ethnographies of Race, Gender, and Desire," NYU Libraries, accessed October 1, 2015, http://guides.nyu.edu/ld.php?content_id=15337336.
7. John D. Sutter, "List: States Where Rape Is Most Common," CNN.com, last modified February 4, 2014, <http://www.cnn.com/2014/02/03/opinion/sutter-alaska-rape-list>.
8. Federal Bureau of Investigation, "Uniform Crime Reports," accessed August 23, 2015, <https://www.fbi.gov/about-us/cjis/ucr/ucr>.
9. Andrea Giunta, "Strategies for Modernity in Latin America," in *Beyond the Fantastic*, ed. Gerardo Mosquera (London: Institute of International Visual Arts, 1995), 57–61; "Visual Rhetoric/Visual Literacy: Writing with Maps," Writing Studio, Thomson Writing Program, Duke University, accessed August 23, 2015, <https://twp.duke.edu/uploads/assets/maps.pdf>.
10. "Visual Rhetoric." We used a modified set of questions originally proposed by the Thomson Writing Program's Writing Studio at Duke University.
11. Mary Louise Pratt, "Arts of the Contact Zone," *Profession* 91 (1991): 35.
12. *Framework for Information Literacy for Higher Education* (Chicago: Association of College and Research Libraries, 2015, last updated February 9, 2015), <http://www.ala.org/acrl/standards/ilframework>.

Bibliography

- Anzaldúa, Gloria. *Borderlands/La Frontera: The New Mestiza*. San Francisco: Aunt Lute, 1987.
- Association of College and Research Libraries. *Framework for Information Literacy for Higher Education*. Chicago: Association of College and Research Libraries, 2015, last updated February 9, 2015, <http://www.ala.org/acrl/standards/ilframework>.
- Battista, Andrew, and Jill Conte. "Worksheet for WRII-UF 102: Ethnographies of Race, Gender, and Desire." NYU Libraries. Accessed October 5, 2015. http://guides.nyu.edu/ld.php?content_id=15337336.

- Conte, Jill, and Andrew Battista. "Gender and Sexuality Studies: WRII-UF 102: Ethnographies of Race, Gender, and Desire." NYU Libraries research guide. Last modified July 22, 2015. <http://guides.nyu.edu/WRII-UF102>.
- Essig, Laurie. "Trigger Warnings Trigger Me." *Chronicle of Higher Education*. March 10, 2014. <http://chronicle.com/blogs/conversation/2014/03/10/trigger-warnings-trigger-me>.
- Federal Bureau of Investigation. *Reporting Rape in 2013: Summary Reporting System (SRS) User Manual and Technical Specification*. Washington, D.C.: Federal Bureau of Investigation, April 9, 2014. <https://www.fbi.gov/about-us/cjis/ucr/recent-program-updates/reporting-rape-in-2013-revised>.
- . "Uniform Crime Reports." Accessed August 23, 2015. <https://www.fbi.gov/about-us/cjis/ucr/ucr>.
- Gitelman, Lisa, ed. *"Raw Data" Is an Oxymoron*. Cambridge, MA: MIT Press, 2013.
- Giunta, Andrea. "Strategies for Modernity in Latin America." In *Beyond the Fantastic: Contemporary Art Criticism from Latin America*. Edited by Gerardo Mosquera, 52–67. London: Institute of International Visual Arts, 1995.
- Halberstam, Jack. "You are Triggering Me! The Neo-Liberal Rhetoric of Harm, Danger and Trauma." *Bully Bloggers* (blog), July 5, 2014. <https://bullybloggers.wordpress.com/2014/07/05/you-are-triggering-me-the-neo-liberal-rhetoric-of-harm-danger-and-trauma>.
- Halpern, Orit. *Beautiful Data*. Durham, NC: Duke University Press, 2014.
- Joque, Justin. "From Data to the Creation of Meaning Part 1: Unit of Analysis as an Epistemological Problem." *IASSIST Quarterly* 38, no. 2 (2014): 7–11.
- Pratt, Mary Louise. "Arts of the Contact Zone." *Profession* 91 (1991): 33–40.
- Sutter, John D. "List: States Where Rape Is Most Common." CNN.com. Last modified February 4, 2014. <http://www.cnn.com/2014/02/03/opinion/sutter-alaska-rape-list>.
- Womack, Ryan. "Data Visualization and Information Literacy." *IASSIST Quarterly* 38, no. 1 (2014): 12–17.
- Writing Studio, Thomson Writing Program, Duke University. "Visual Rhetoric/Visual Literacy: Writing with Maps." Accessed August 23, 2015. <https://twp.duke.edu/uploads/assets/maps.pdf>.