Two Birds One Stone:
Supporting data literacy and encouraging civic engagement using framework-inspired library programming.

Jo Klein GIS and Data Visualization Librarian
Megan Carlton Science Librarian
1. Data literacy
2. Civic engagement & citizen science
3. The library’s role
4. Examples of library programming
Data Literacy
What is data literacy?

The ability to consume for knowledge, produce coherently and think critically about data.

Historically relates to statistical and numerical fields.

Data information literacy (DIL) has a more expansive definition and concerns the activities of the data creator and consumer.

Bounegru, 2012; Image from Glusker, 2017
What does **data literacy** mean to you?

Go to **www.menti.com** and use the code **69 82 72**

1. Grab your phone
2. Go to www.menti.com
3. Enter the code 69 82 72 and vote!
“A data literate person possesses the knowledge to gather, analyze, and graphically convey information and data to support decision making for quantitative and qualitative assessments and measurements (statistics).”

-kYmberly Keeton, Hip Hop LibGuide
Carlson’s **Data Literacy** Competencies

- Documentation and metadata
- Security and backups
- Directory structures and naming conventions
- Data sharing and citation
- Data integration
- Good file formats for long-term access
- Best practices for data retention and archiving
The Importance of Data Literacy

Carlson, 2015
The Research Data Management Lifecycle

Adapted from the Research Data Management Lifecycle (diagram), Data Management LibGuide, University of California, Santa Cruz, viewed 26th July 2019 <http://guides.library.ucsc.edu/datamanagement>
Using Data in **K-12 Programming**

- To prepare students to address real world complex problems;
- To develop students’ ability to use scientific methods;
- To prepare students to critically evaluate the validity of data or evidence and of their consequent interpretations or conclusions;
- To teach quantitative skills, technical methods, and scientific concepts;
- To increase verbal, written, and graphical communication skills; and
- To train students in the values and ethics of working with data.
Incorporating Data Literacy in K-12

Some crosswalks exist connecting data literacy competencies to K-12 standards.

Calzada, 2013
What data should you use?

NC Environmental Literacy Plan

● “Provide field experiences as part of the regular school curriculum…”

NC standards correlations available in:

● Project WILD
● Project WET
● Project Learning Tree
Civic Engagement & Citizen Science
“During these increasingly fractious times, strengthening the foundations of civic engagement — volunteering, voting, participating in civic and social organizations and engaging in activities that strengthen community and seek common ground — is particularly important.”

Data Literacy & Civic Engagement

A data literate person can:

- Understand, interpret, and evaluate data from polls, surveys, the US decennial census, and other data sources
  - Including statistics and data visualizations
- Understand and interpret data about current events and community issues, including:
  - Climate change data
  - Health & environment data
  - Demographic data
"The public’s limited knowledge in science, technology, engineering, and math (STEM) is a problem for scientific progress.”

Creates a gap between the scientific consensus and public belief

Funk C, Rainie L. Public and scientists’ views on science and society. Pew Research Centers Internet American Life Project 2015
What is **citizen science**?

Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions (Oxford English Dictionary).

Public participation in scientific research
Citizen science projects are excellent for developing science-related skills:

- Identifying organisms
- Using measurement instruments
- Collecting field data
- Following protocols
- Process of research
- How scientific questions are asked and answered
Enter: the Library
Why the library?

We are informal educators. These projects are a great way to engage people in learning science and data skills in a fun and meaningful way, while breaking down the barrier between the public and research and civics.

We are also community hubs. People come to libraries to access information and connect with their community. Often, we are the only point of access folks have to computers and the internet.
How do I do this at my library?

Provide opportunities for people to develop interest and engagement by either trying something new or by expanding previously existing interests. For example, when a bird watcher begins to report their bird sightings....
How do I do this at my library?

1. Pick an “Avenue”

1. Publishing self-training resources “on the web”
2. Contributing to credit courses
3. Providing reference service and instruction

More examples:
- Online workshops and webinars
- Libguides
- Flipped learning websites
- Infographics & worksheets
- Workshops and boot camps
- Challenges, web-scraping, and other data-specific events
- Walking tours/events (geocaching & geospatial data)

Prado and Marzal, 2013
How do I do this at my library?

2. Incorporate datasets & other resources
How do I do this at my library?

3. Engage & connect with community initiatives
Examples of Library Programming
Citizen Science Events & Challenges

City Nature Challenge

Ready, Set, Snap: WNC to Compete in the 2019 City Nature Challenge

POSTED APRIL 22, 2019 BY WHITNEY SMITH IN COMMUNITY, NATURE

Calling all nature (smart phone) lovers! Do you love Western North Carolina and all of its natural beauty? Do you find yourself taking photos of plants or animals that you encounter on your hikes? Do you love to WIN competitions while also supporting scientific research? Then join us for the 2019 City Nature Challenge!
### Endangered Data Week

<table>
<thead>
<tr>
<th>Institution</th>
<th>Topic</th>
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<tbody>
<tr>
<td>University of Minnesota Libraries</td>
<td>Endangered Data, Data Ethics, and ‘Vulnerable’ Populations</td>
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<tr>
<td>University of Minnesota Libraries</td>
<td>FOIA for Scholarship and Publication</td>
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<td>Michigan State University</td>
<td>Wikipedia Edit-a-thon: Michigan Superfund Sites</td>
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<td>Data Wrangling in R with the Tidyverse</td>
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<tr>
<td>Boston College</td>
<td>Endangered Data Week: Introduction to Civic &amp; Public Data</td>
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<tr>
<td>University of Montana</td>
<td>Endangered Languages as Endangered Data</td>
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<tr>
<td>The Claremont Colleges Library</td>
<td>Data Cleaning Workshop</td>
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<tr>
<td>University of Pennsylvania</td>
<td>Government Shutdown and Data</td>
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https://endangereddataweek.org/
In-Class Instruction

**LESSON 4: EXOPLANET DETECTION**

In this lesson, students will first engage in an activity that offers an opportunity to use various methods of observation to identify an object without being able to directly observe it with their eyes. Next, students will be asked to research and present to the class one of the direct or indirect methods that scientists use to detect planets around distant stars. Detection methods covered include transit, Doppler, and direct imaging.

**SUPPLEMENTARY MATERIALS**

- Stellar System Images
- Star Signage
- Detection Methods sheets
- Evaluate Other Systems homework

**LESSON 6: USING PLANET HUNTERS**

This lesson acquaints students with the Planet Hunters citizen science project by researching its goals, learning about the project’s science, and participating in the search for exoplanets. Students will watch a video tutorial that explains how the Planet Hunters website works, engage in analyzing light curves and look for possible transits that might indicate the presence of exoplanets.

**SUPPLEMENTARY MATERIALS**

- Planet Hunters Star I.D. Chart

http://go.uncg.edu/nasa-ph-guide
EPA Air Quality Curriculum

MODULE 1 - AIR POLLUTANTS AND THEIR SOURCES

- MODULE 1 SUMMARY
  7 activities and 4 videos covering the basic science of air quality including: properties of air, combustion, the criteria pollutants, local & regional pollution data, and detecting ozone and particulate matter.

  + 1-1 WHAT IS AIR?
  + 1-2 COMBUSTION & COMBUSTION EQUATIONS
  + 1-3 PARTS PER MILLION

MODULE 2 - PREDICTING AIR POLLUTION

- MODULE 2 SUMMARY
  3 activities and 1 video exploring the science of predicting air pollution including: the air quality index, developing a model to predict ground-level ozone, and air quality monitoring forecasting.

  + 2-1 WHAT'S AN AIR QUALITY INDEX?
  + 2-2 MAKING A SIMPLE PREDICTIVE MODEL FOR GROUND-LEVEL OZONE POLLUTION
  + 2-3 FORECASTING AIR QUALITY

MODULE 3 - AIR POLLUTION PROBLEMS AND SOLUTIONS

- MODULE 3 SUMMARY
  5 activities and 4 videos introducing possible solutions to our air quality problems including: scientific research, personal energy and driving choices, technology solutions, energy efficiency, alternative energy, regulations.

  + 3-1 SCIENTIFIC LITERACY AND AIR QUALITY
  + 3-2 INTRODUCTION TO SOLUTIONS & HOME ENERGY CHOICES
  + 3-3 DRIVING CHOICES & CALCULATING CAR
Workshops & Self-Guided Learning

Data Carpentry

Getting Started

Data Carpentry’s teaching is hands-on, so participants are encouraged to use their own computers to ensure the proper setup of tools.

These lessons assume no prior knowledge of the skills or tools.

To get started, follow the directions in the “Setup” tab to download data to your computer and follow any installation instructions.

Prerequisites

This lesson requires a working copy of R and RStudio.

To most effectively use these materials, please make sure to install everything before working through this lesson.

For Instructors

If you are teaching this lesson in a workshop, please see the Instructor notes.

Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Download files required for the lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
<td>1. Before we Start</td>
<td>How to find your way around RStudio? How to interact with R? How to manage your environment? How to install packages?</td>
</tr>
<tr>
<td>00:40</td>
<td>2. Introduction to R</td>
<td>What data types are available in R? What is an object? How can values be initially assigned to variables of different data types? What arithmetic and logical operators can be used? How can subsets be extracted from vectors and data frames? How does R treat missing values? How can we deal with missing values in R?</td>
</tr>
<tr>
<td>02:00</td>
<td>3. Starting with Data</td>
<td>What is a data frame? How can I read a complete csv file into R? How can I get basic summary information about my dataset?</td>
</tr>
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</table>

Barplots

Barplots are also useful for visualizing categorical data. By default, `geom_bar()` accepts a variable for x, and plots the number of instances each appears in the dataset.

```r
ggplot(data = interviews_plotting, aes(x = respondent_wall_type)) + geom_bar()
```

We can use the `fill` aesthetic for the `geom_bar()` to color bars by the portion of each count that is from each village.
Data Privacy Project

Library Risk Assessment Profiles

**Patron 1**, 20s: has smartphone and uses it for calls, text messaging, and occasionally for surfing the web. They use desktop computers at the library to apply for jobs and also shop online and to use Facebook.

**Patron 2**, an older adult: their only internet access is on library terminals, and they set up their first email account on a library terminal. They attend library classes for older adults on digital literacy.

**Patron 3**, 30s: they are a freelance journalist who frequently brings their laptop to the library and uses the public wifi. They conduct skype interviews with sources in public places, use Facebook and Twitter to communicate with sources and to promote stories.

**True or false**: When you use a library terminal, the library knows what sites you have visited.

[True] [False]

**Step 1. Library user logs on.**

A web user logs in at the library home screen. She enters her patron ID and password onto the screen. Once the library’s integrated library system validates her log-in credentials, she can use the computer to access the web.

**TERMS**

Integrated Library System: a relational database with patron-facing and staff-facing interfaces that allows the library to manage acquisitions, cataloging, circulation and reserves, serials holdings, and the online public access catalog.

log-in credentials: a username and password created by the user.

https://dataprivacyproject.org
Shoutout


Contains gems like:

- “‘But it’s a number, so it has to be true!’: An introduction to data literacy”
- “Real world data fluency: How to use raw data”
- “Data literacy and voting”
- “Using Social Explorer to help students gain insight”
Thanks!

Any questions?

You can find us at:
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Megan Carlton | megancarlton@uncg.edu
References


Presentation template by SlidesCarnival
[Exit, pursued by a librarian]