

# Teaching Open Web Mapping

**AutoCarto 2016**

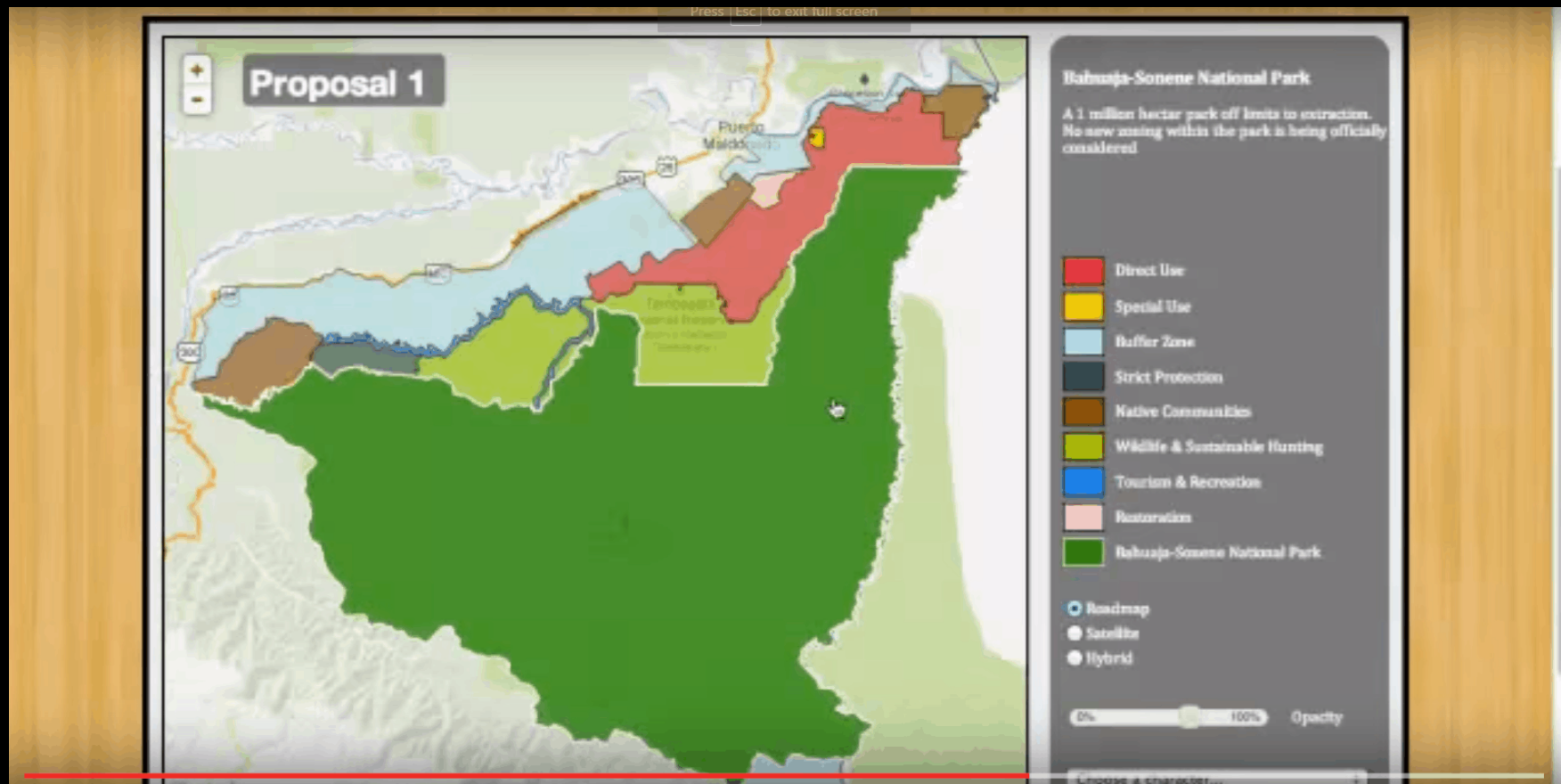


Carl M. Sack . [cmsack@wisc.edu](mailto:cmsack@wisc.edu)  
Robert E. Roth . [reroth@wisc.edu](mailto:reroth@wisc.edu)  
University of Wisconsin-Madison

# Outline

- About Geography 575 (Interactive Cartography and Geocomputing)
- Technology transition (Flash to JavaScript)
- 2014 Course Curriculum
- Course evaluation
- 2016 Curriculum Changes
- Preliminary outcomes and future prospects

# Web mapping in Geography 575



# The G575 web mapping technology stack...

2011



# The G575 web mapping technology stack...

2011



2016



TopoJSON



# The G575 web mapping technology stack...

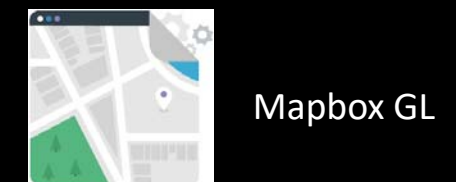
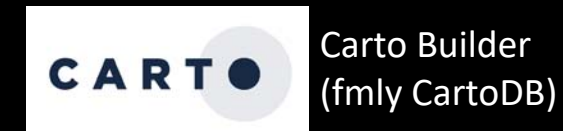
2011



2016



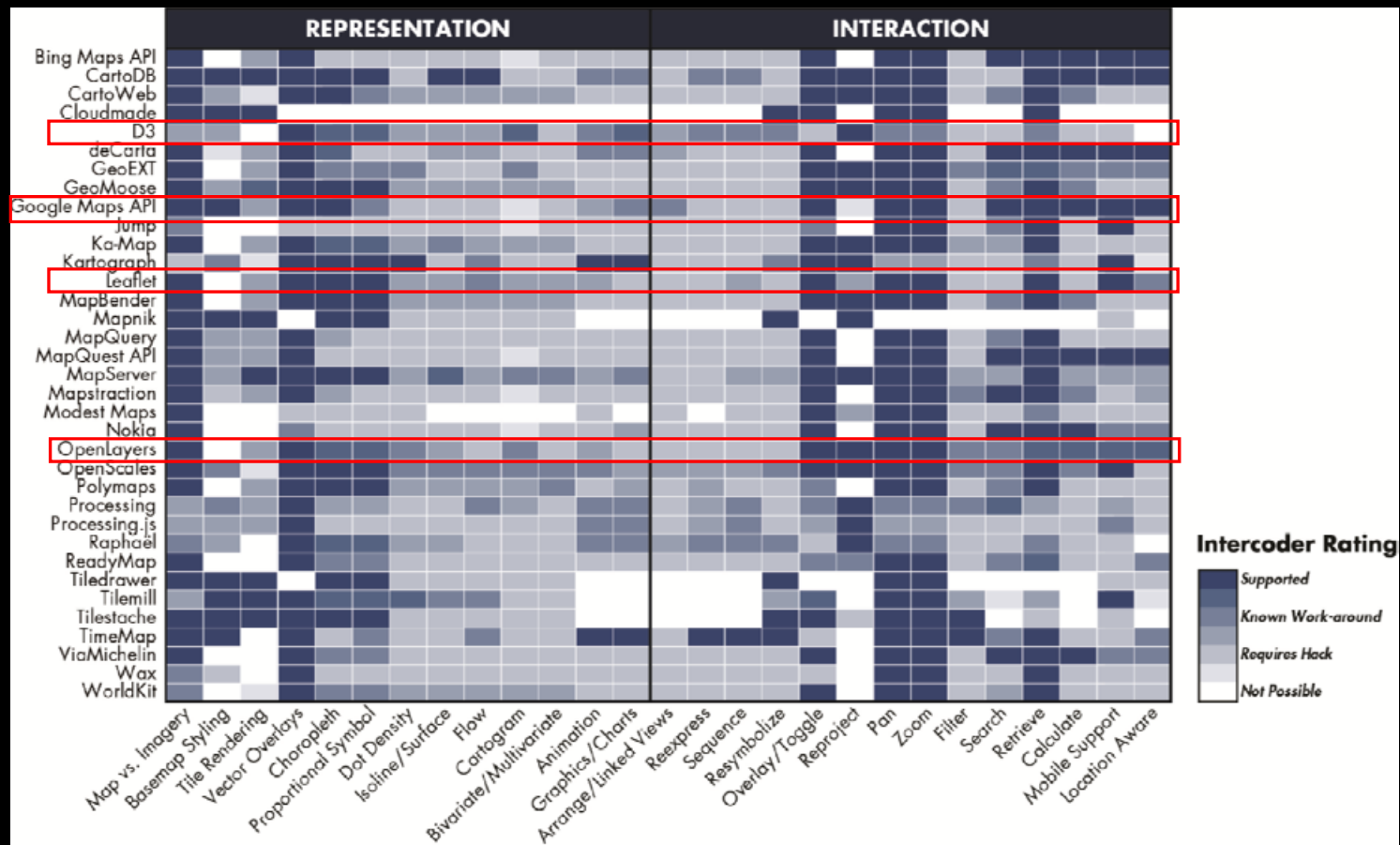
Others...



# Geography 575 Timeline

- Spring 2012: Last teaching of Adobe Flash
- Summer-Fall 2012: Web mapping technology study
- Spring 2013: First teaching with JavaScript, Leaflet, and D3
- Fall 2014: Scaffolded lab curriculum
- Spring 2016: Modularized online lab curriculum

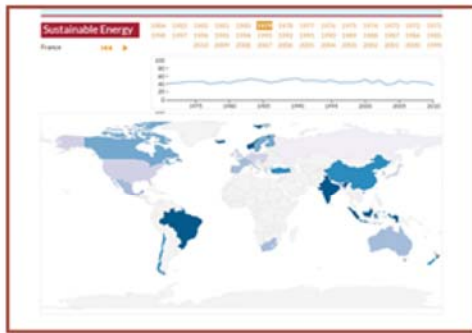
# 2012 Technology Study



From Roth et al. (2014). "A Process for Keeping Pace with Web Mapping Technologies." *Cartographic Perspectives* 78 (DOI 10.14714/CP78.1273)



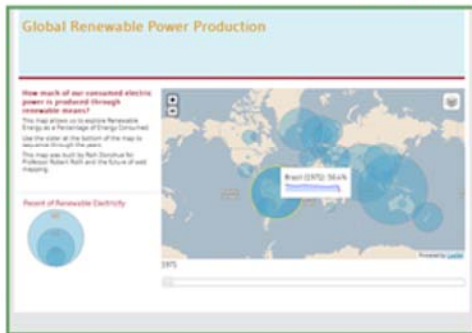
# 2012 Technology Study



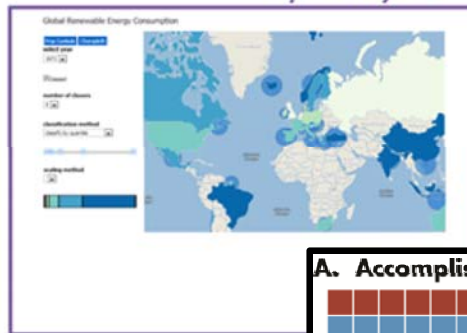
D3



Google Maps API



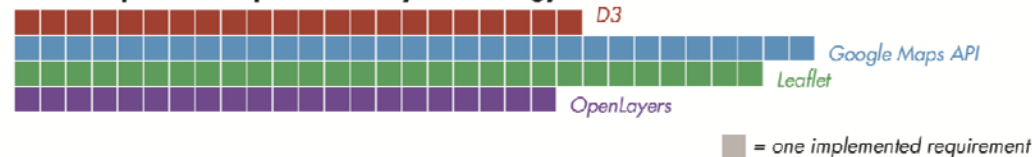
Leaflet



OpenLayers

From Roth et al. (2014). "A Process for Keeping Pace with Web Mapping Technologies." *Cartographic Perspectives* 78 (DOI 10.14714/CP78.1273)

## A. Accomplished Requirements by Technology

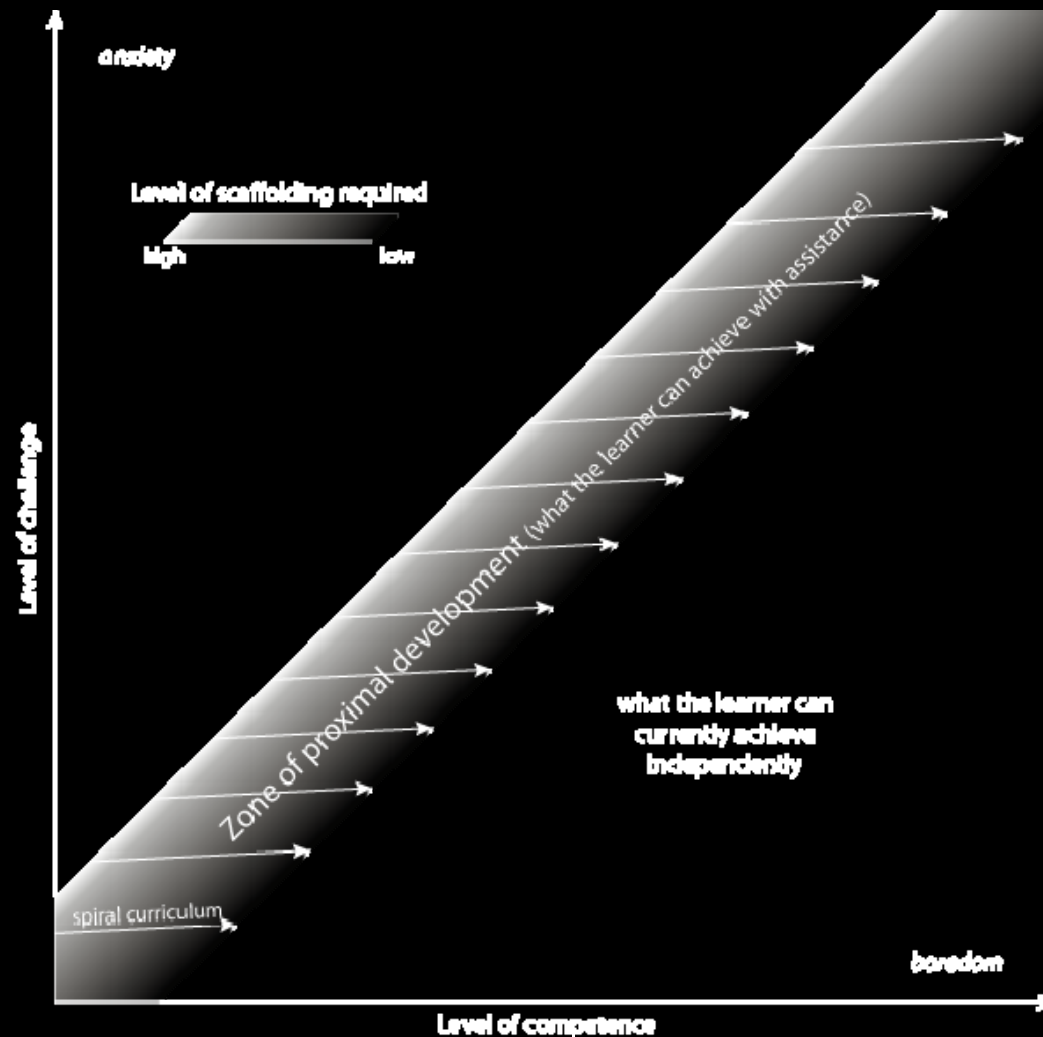


## 2013: Let's Try It!



(not actual students)

# Rethinking Our Teaching Strategy








# 2014: A New Curriculum Sequence

Pre-Lab	Lab 1 (Leaflet)	Lab 2 (D3)	Final Project
<b>Week 0</b> (no lab meeting) Online JavaScript Tutorial	<b>Week 3</b> Using Reference Documentation Online Forums and Examples Slippy Map Tile Concepts Leaflet Basic Concepts and Methods	<b>Week 6</b> GitHub Concepts and Web Hosting SVG Basic Elements and Attributes D3 API Reference and Examples D3 Core Selectors and Generator Functions	<b>Weeks 10-13</b> Individualized Assistance
<b>Week 1</b> Text Editors Directory Structure HTML Basic Elements and Attributes CSS Basic Style Rules JavaScript Basic Concepts jQuery Basic Concepts	<b>Week 4</b> Using Developer Tools for Debugging Custom UI Elements and Interactions	<b>Week 7</b> Final Project Group Selection D3 Interactions D3 Geography	<b>Week 14</b> Final Project Completion
<b>Week 2</b> Data Levels and Types Geographic Coordinates Data Language Specifications AJAX (Asynchronous JavaScript and XML)	Conference Week (no lab meeting)	<b>Week 8</b> Workshop Final Project Proposals Individualized Assistance	
	<b>Week 5</b> Individualized Assistance (final week for Lab 1)	<b>Week 9</b> Review: TopoJSON, D3 Projections, Debugging Individualized Assistance (final week for Lab 2)	

# Assessment: Entrance Survey

Student familiarity with HTML, CSS, and JavaScript prior to taking the course

Answer		Frequency	%
Professional hacker or web designer		1	3%
Comfortable		4	14%
Moderately familiar		9	31%
A little familiar		10	34%
No familiarity or experience		5	17%
Total		29	100%

# Assessment: Instructor Logs & Student Feedback

Me: “[T]he attitude generally seems to be ‘I’m learning and know I’ll get beyond this’ rather than helplessness or giving up.”

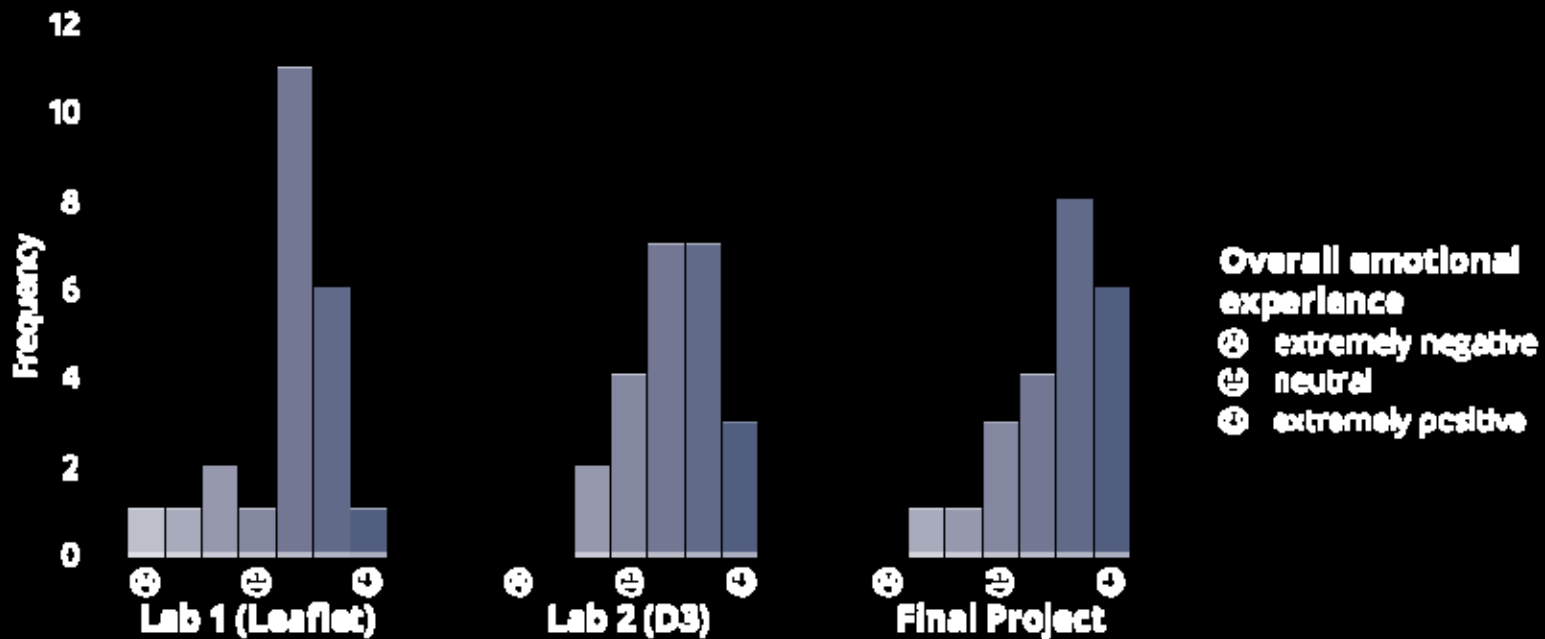
Students: “I needed to break it down and solve things one at a time, not all at once.”

Some key threshold concepts:

- Identifying & integrating methods from different libraries
- Integrating code from online examples
- Working with data, AJAX, and the DOM

# Assessment: Exit Survey

- Expertise with tools: low → moderate
- Steady increase in learning and self-confidence

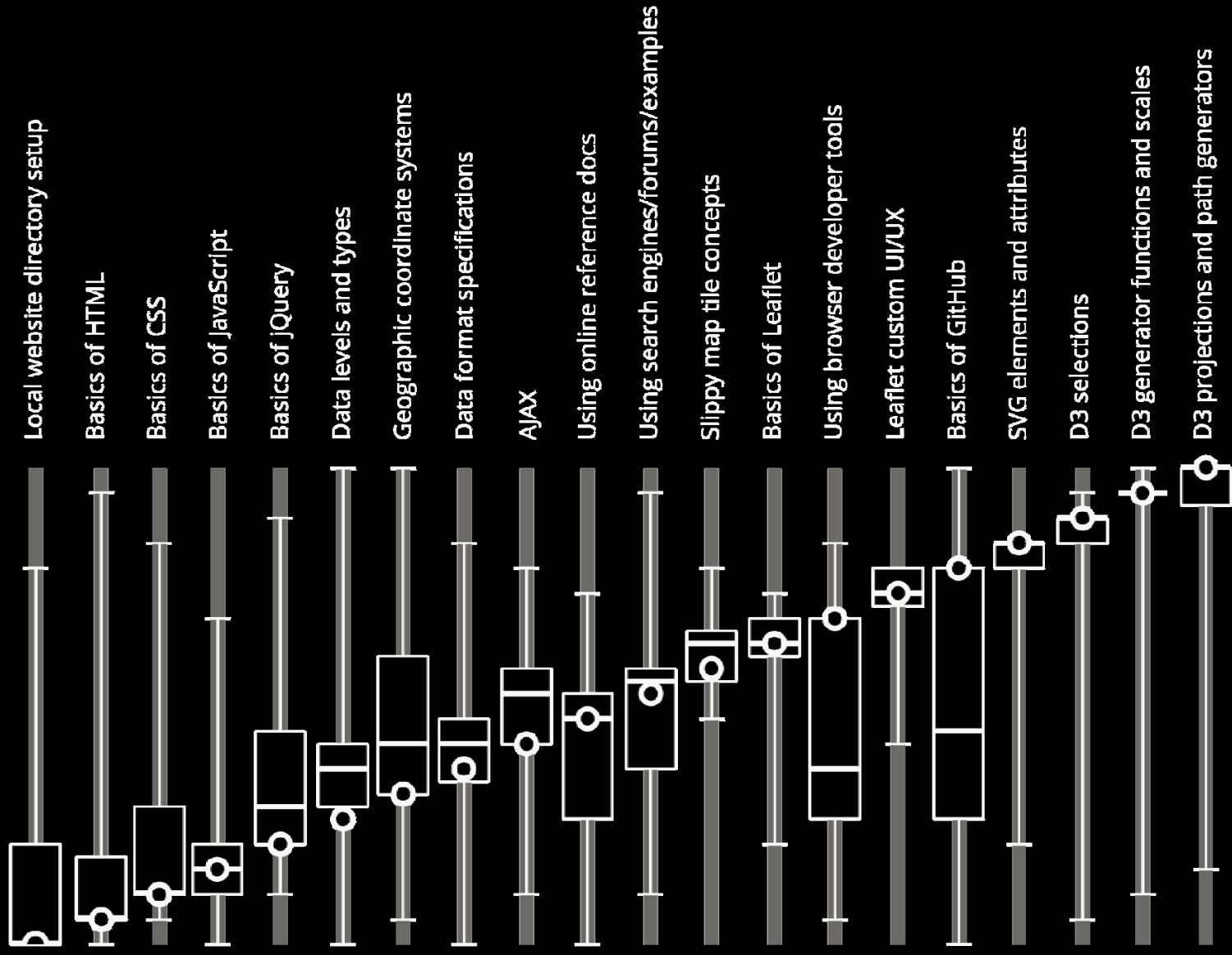


# G575 Lab Learning Objectives

- Computational Thinking
  - understand the flow of execution in a computer program and solve problems in the code.
- Competence
  - apply Open Web Platform mapping tools successfully across a range of mapping contexts.
- Confluence
  - analyze how data, representation, and interaction tools integrate across the web mapping workflow.
- Confidence
  - evaluate one's achievements positively and trust one's ability to improve at difficult web mapping tasks.

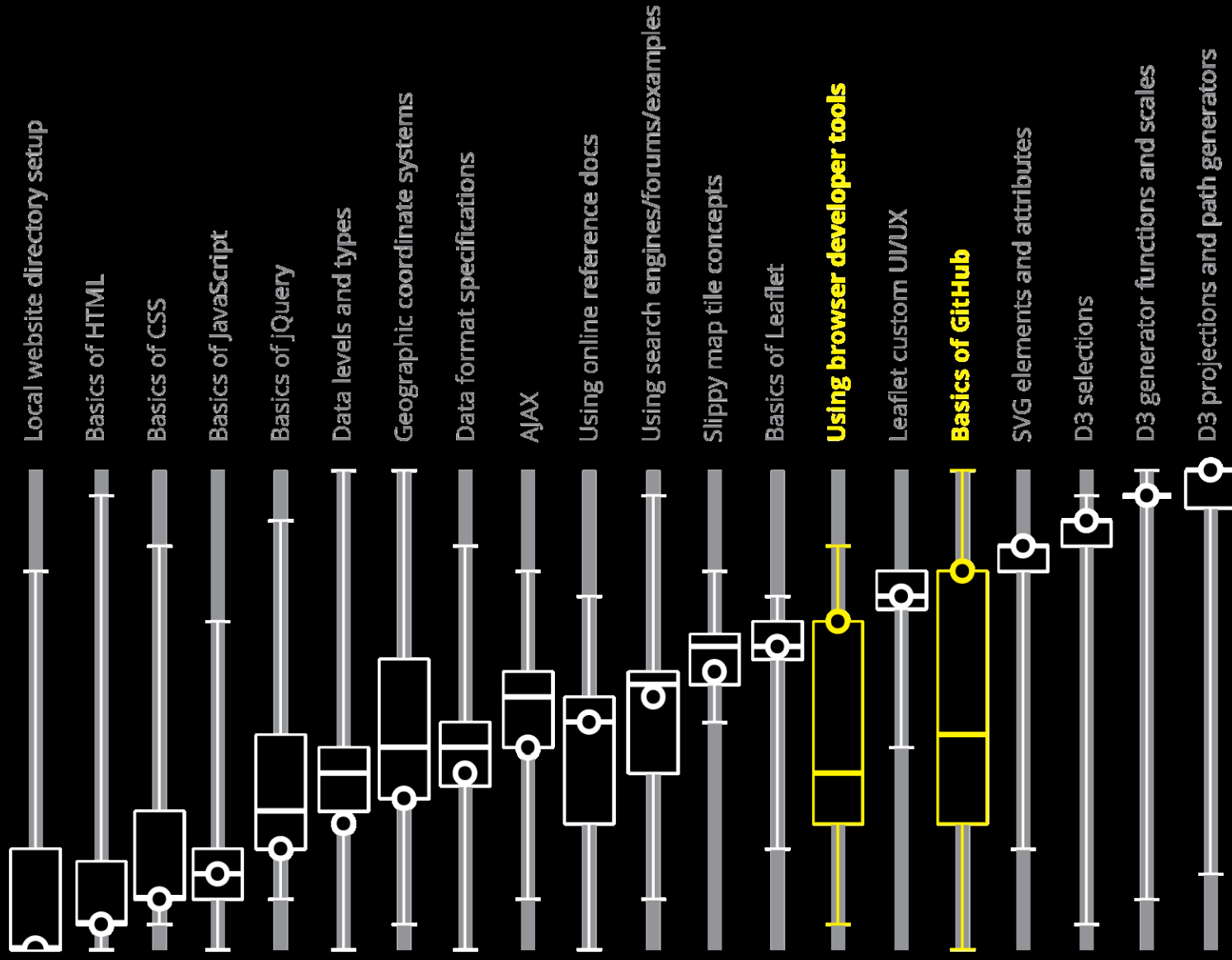


Course  
Start



Course  
End

Course  
Start



Course  
End

# 2016: A Brave New (Online) World

## Module 1: Setting Up Your Workspace

### Introduction

Welcome to the first module of Geography 575! In this module, we will start with a look at some boilerplate HTML and a few popular frameworks you might use to structure your website. This information should review and build on the knowledge of website design you gained in Geography 572. Second, we will take a look at how to neatly and efficiently set up your workspace and host it through a localhost development server. Finally, we will set up a GitHub account you can use for cloud storage, version control, web hosting, and collaboration with other developers and add a repository for your website.

When you have finished this module, you should be able to:

- **Select a framework or boilerplate for use as the base of your website**
- **Build a website directory hosted on a localhost server**
- **Create a GitHub repository for your website and sync it with your local directory**

### Lesson 1: Boilerplates and Frameworks

#### I. Text Editors

By this point, you should already be familiar with one or more open-source text editors. Different editors include various features, such as color-coding specific to different code languages, automatic indentation and closing tags, and live preview. Since these are updated with new features regularly, now is a good time to review your choice of editor and compare it to other available editors to see if it may be worth switching. Some popular editors as of this writing are:

**Notepad++:** a simple, lightweight text editor with a number of available plugins and a large user community. Windows only.

**Sublime Text:** a user-friendly text editor with a number of useful features such as programmable keyboard shortcuts, a robust find/replace tool, and autocomplete. Available for Windows, Mac OS X, and Linux.

**Aptana Studio:** a full-featured open-source IDE (Integrated Development Environment) with a design based on Eclipse, but specialized for web languages. Available for Windows, Mac OS X, and Linux.

**Brackets:** Adobe's open-source text editor includes a web directory tree, live preview, and slick design.

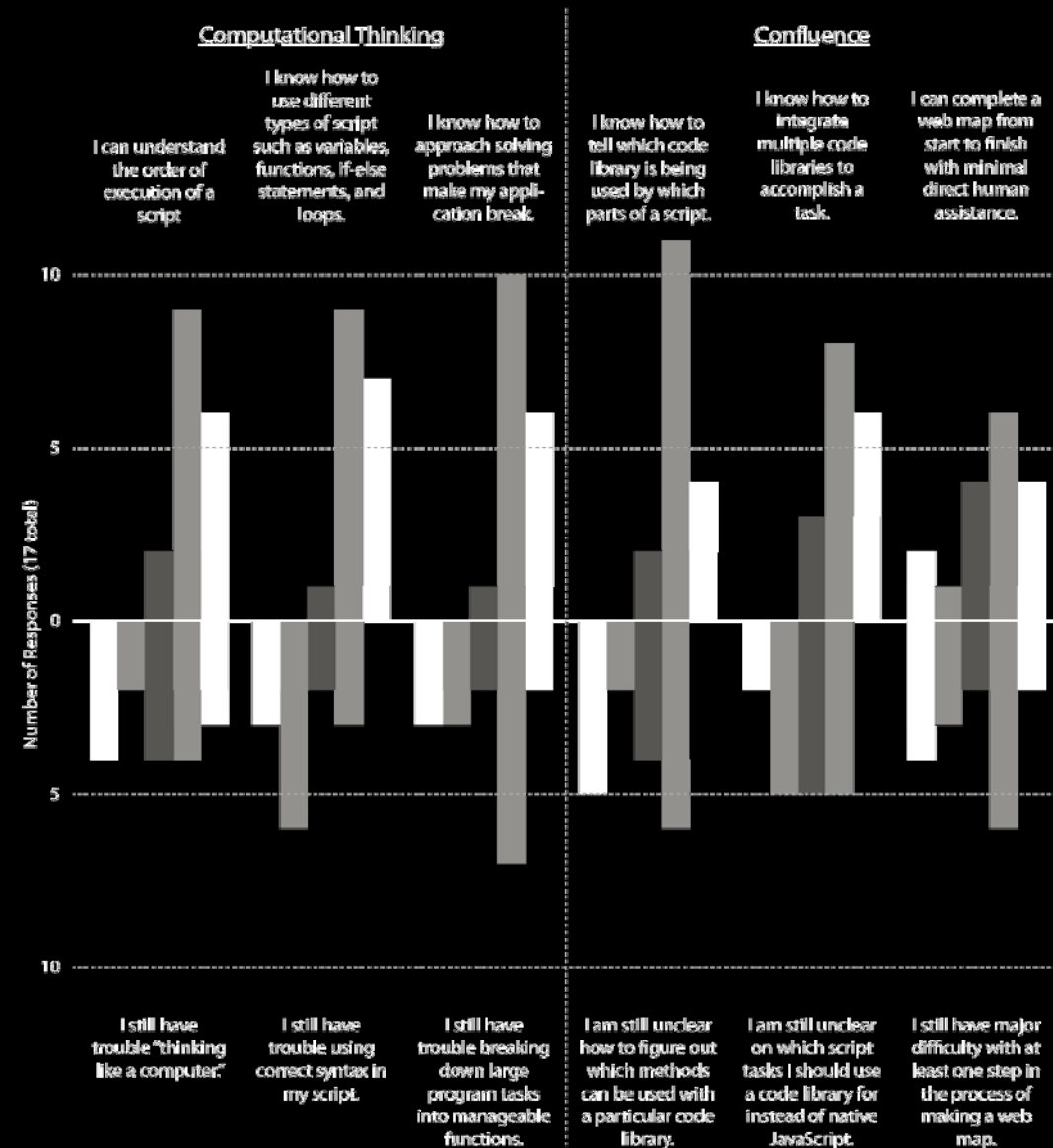
**Atom:** An open-source text editor by GitHub, similar to Sublime or Brackets. It integrates with your working Git repository to color-code files that have been added or changed in the file tree. Available for Windows, Mac OS X, and Linux.

# 2016 Revised Topic Sequence

Unit 1	Unit 2	Unit 3	Final Project
<b>Module 1: Setting Up Your Workspace</b> Boilerplates and Frameworks Web Directory Setup GitHub Setup (moved from Week 6) Assigned: JavaScript Online Tutorial	<b>Module 4: Using Online Resources</b> Leaflet Tutorials and API Using Online Examples Using Help Forums Finding Tilesets and Data	<b>Module 7: D3 Foundations</b> D3 Selections and Blocks Data Scales, Axes, Text	Group work on final projects
<b>Module 2: Scripting and Debugging</b> Exploring the DOM JavaScript Basics jQuery Basics Debugging in the Developer Console (moved from Weeks 4 and 9)	<b>Module 5: Leaflet Interactions</b> Making Leaflet Layers Dynamic Zoom, Pan, and Retrieve Interactions Sequence Interaction Additional Interaction Operators	<b>Module 8: Mapping in D3</b> D3 Helpers: TopoJSON, MapShaper & Queue D3 Projections and Path Generators	
<b>Module 3: Data and AJAX</b> CSV, XML, and JSON formats and their geographic variants AJAX Concepts and Syntax AJAX Callback Functions	<b>Module 6: The Internal Logic of Leaflet</b> Object-oriented JavaScript Extending Leaflet Objects Using SVG Graphics	<b>Module 9: Coordinated Visualizations</b> Dynamic Map Styling Drawing a Coordinated Visualization	
		<b>Module 10: Coordinated Interactions</b> Dynamic Attribute Selection Transitions Linking Interactions Between Map and Chart	

# 2016 Assessment (sketch)

- Similar competence outcomes
  - Possibly significant improvement in AJAX
- Challenging or not depending on prior coding experience
- Generally positive & empowering experience
- Too 'cookbooky'?



# Questions

This slideshow: [tinyurl.com/sack-autocarto-2016](http://tinyurl.com/sack-autocarto-2016)

Tutorials based on Geography 575–2014 lab assignments:  
[github.com/uwcart/cartographic-perspectives](https://github.com/uwcart/cartographic-perspectives)

Student projects gallery:  
[geography.wisc.edu/courses/geog575](http://geography.wisc.edu/courses/geog575)

Teaching web mapping? Come talk to me!



Carl M. Sack . [cmsack@wisc.edu](mailto:cmsack@wisc.edu)  
Robert E. Roth . [reroth@wisc.edu](mailto:reroth@wisc.edu)  
University of Wisconsin-Madison  
A portion of this research was funded by NSF Grant #1555267