

Interpreting Different Spatiotemporal Data Visualizations: What Strategies Do Students Use?

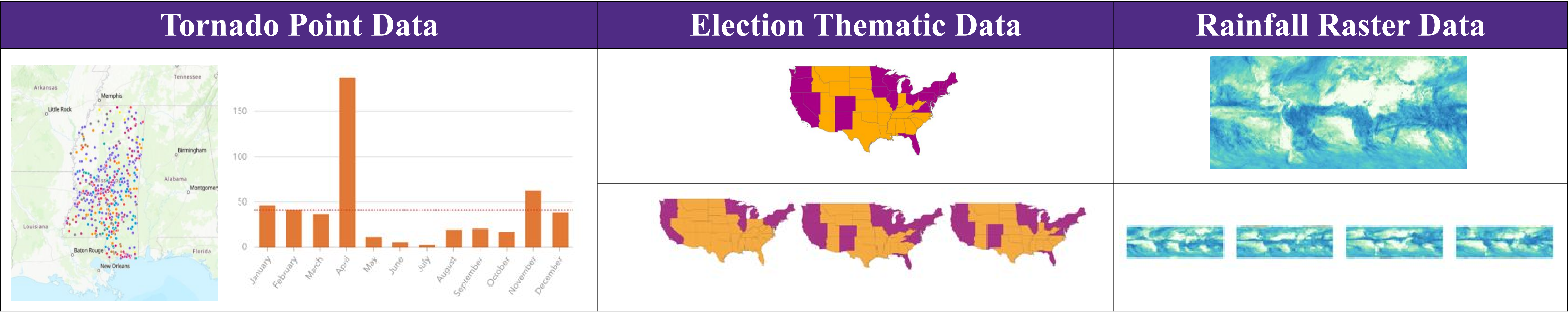
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Introduction

- Spatiotemporal (ST) data illustrate information across many disciplines, and data visualization literacy framework emphasizes the importance of data interpretation skills (Borner et al., 2018).
- Students’ understandings may vary across visualization types, and ST data is uniquely challenging because it requires students to integrate spatial *and* temporal information (Myer et al., 2018).
- To support students’ interpretation of ST data, we ask:
 - How do students’ strategies for interpretation vary across data visualization types?
 - How do students’ questions vary across data visualization types?

Methods

- Twenty-three undergraduates met with a researcher on Zoom and viewed three types of visualizations (see Figure below).
 - 61% female students, 39% male students
 - 35% white, 35% Asian, 9% black, 4% Latine, 17% Multi-ethnic
- For each visualization, students were asked:
 - What do you notice? What patterns do you see?
 - What strategies are you using to identify patterns?
 - What do wonder about these visuals?
- Thematic analyses were used to identify students’ different strategies and question types.



Strategy & Question Type	Tornado Point Map	Thematic Election Map	Rainfall Raster Map	χ^2	p
Strategies					
Grouping by color	46%	44%	43%	.059	.971
Drawing on prior knowledge	14%	33%	28%	2.91	.234
Comparing across multiple images	5%	27%	18%	4.82	.090
Searching for clusters	32%	18%	10%	4.63	.099
Looking for patterns	23%	4%	28%	8.74	.013
Focusing on small areas	14%	27%	5%	7.55	.023
Focusing on large regions	0%	16%	0%	10.32	.006
Horizontal scanning	5%	16%	18%	2.13	.345
Vertical scanning	14%	2%	10%	3.37	.185
Questions					
What causes these ST patterns?	44%	35%	15%	14.31	.001
Requesting more topical information	16%	17%	0%	12.91	.002
How was the data collected/generated?	19%	23%	38%	7.03	.030

Results

- Color Grouping and using Prior Knowledge were the most common strategies used. Students’ use of Looking for Patterns, Focusing on Small Areas, and Focusing on Large Regions differed across visualization types (See Table above).
- Some of students’ wonder questions also varied across visualizations (See Table).
- Male students (39%) were more likely than female students (19%) to use Prior Knowledge, $\chi^2 = 5.03$, $p = .025$.
- Female students (57%) were more likely than male students (25%) to use Color Grouping, $\chi^2 = 10.90$, $p < .001$.

Discussion

- Students’ strategies and questions vary across data visualizations, and male and female students use different strategies and ask different questions when interpreting ST data.
- Future work will connect students’ strategies and questions to their understandings of ST data.
- We aim to inform educators about effective approaches for supporting students’ ST data comprehension.