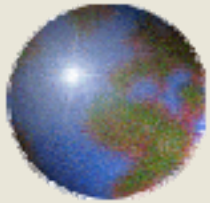

Teaching Creative and Critical Thinking Through News Mapping

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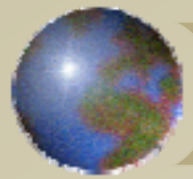
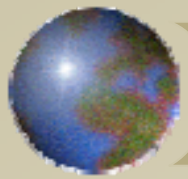


Introduction

- I introduce my students to news mapping in JOUR 450 Advanced Reporting.
- They learn to use GIS as news gathering tool, a story telling tool, and an infographic design tool.



Introduction

- The goal is to enhance their computer-assisted reporting skills and to improve their critical and creative thinking skills.

Introduction

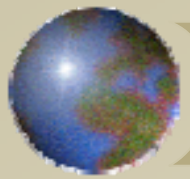
- News maps range from simple locator maps to complex thematic maps or, as Monmonier (1993) calls it, expository cartography.

Introduction

- Because GIS offers students a powerful tool for exploring spatial relationships, visualizing multiple alternative explanations, and transforming their initial visualizations, news map[ping] is an excellent vehicle for infused instruction in critical and creative thinking.

Introduction

- To illustrate, in this paper I will focus on a course unit that teaches students to use GIS as a news gathering tool, specifically as a tool for querying evidence, visualizing alternatives, and drawing conclusions and how that unit offers an opportunity to teach specific critical and creative thinking skills.

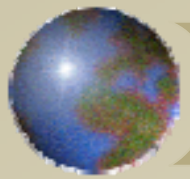


First Things First

- The first units on critical and creative thinking define the concepts and describe the ideal critical and creative thinker.

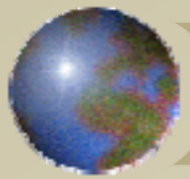
What is Critical Thinking?

- According to Facione (1990), critical thinking is “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (p. 3).



The Ideal Critical Thinker Is:

- habitually inquisitive
- well-informed
- trustful of reason
- open-minded
- fair-minded in evaluation
- flexible
- honest in facing personal biases
- prudent in making judgments
- willing to reconsider

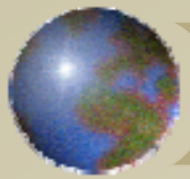


The Ideal Critical Thinker Is:

- clear about issues
- orderly in complex matters
- diligent in seeking relevant information
- reasonable in the selection of criteria
- focused in inquiry
- persistent in seeking precise results
  - [Facione, 1990]

What is Creativity?

- Definitions of creative thinking widely agree on a number of characteristics, including fluency, flexibility, originality, and elaboration, that together produce a novel outcome (Alvino, 1990; Cotton, 1991).

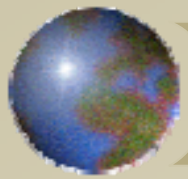


Component Parts of Creative Thinking

- Fluency – “generating many ideas”
- Flexibility – “shifting perspective easily”
- Originality – “conceiving of something new”
- Elaboration – “building on other ideas”
  - (Alvino, 1990; Cotton, 1991)

News Gathering

- The news gathering unit uses the Miami Herald's coverage of Hurricane Andrew (Herzog, 2003) as a case study to examine how reporters use GIS and specific critical and creative thinking skills to explore data and arrive at the best explanation of its meaning.



Cognitive Skills Set

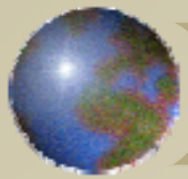
- The specific critical thinking skill examined in this unit is inference, and the creative thinking skill is fluency.
- Other units return to the same case study to illustrate how other cognitive skills are brought to bear on the same problem.

Inference

- “To identify and secure elements needed to draw reasonable conclusions”
- “To form conjectures and hypotheses”
- “To consider relevant information and to educe the consequences flowing from”:
  - (Facione, 1990, p. 16)

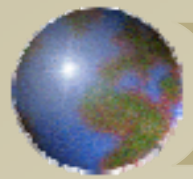
Inference

- Data
- Statements
- Principles
- Evidence
- Judgments
- Beliefs
- Opinions
- Concepts
- Descriptions
- Questions
- Or other forms of representation
  - (Facione, 1990, p. 16)



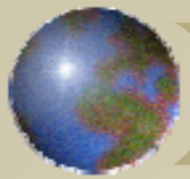
Inference

- Querying Evidence
- Conjecturing Alternatives
- Drawing Conclusions
  - (Facione, 1990, p. 16)



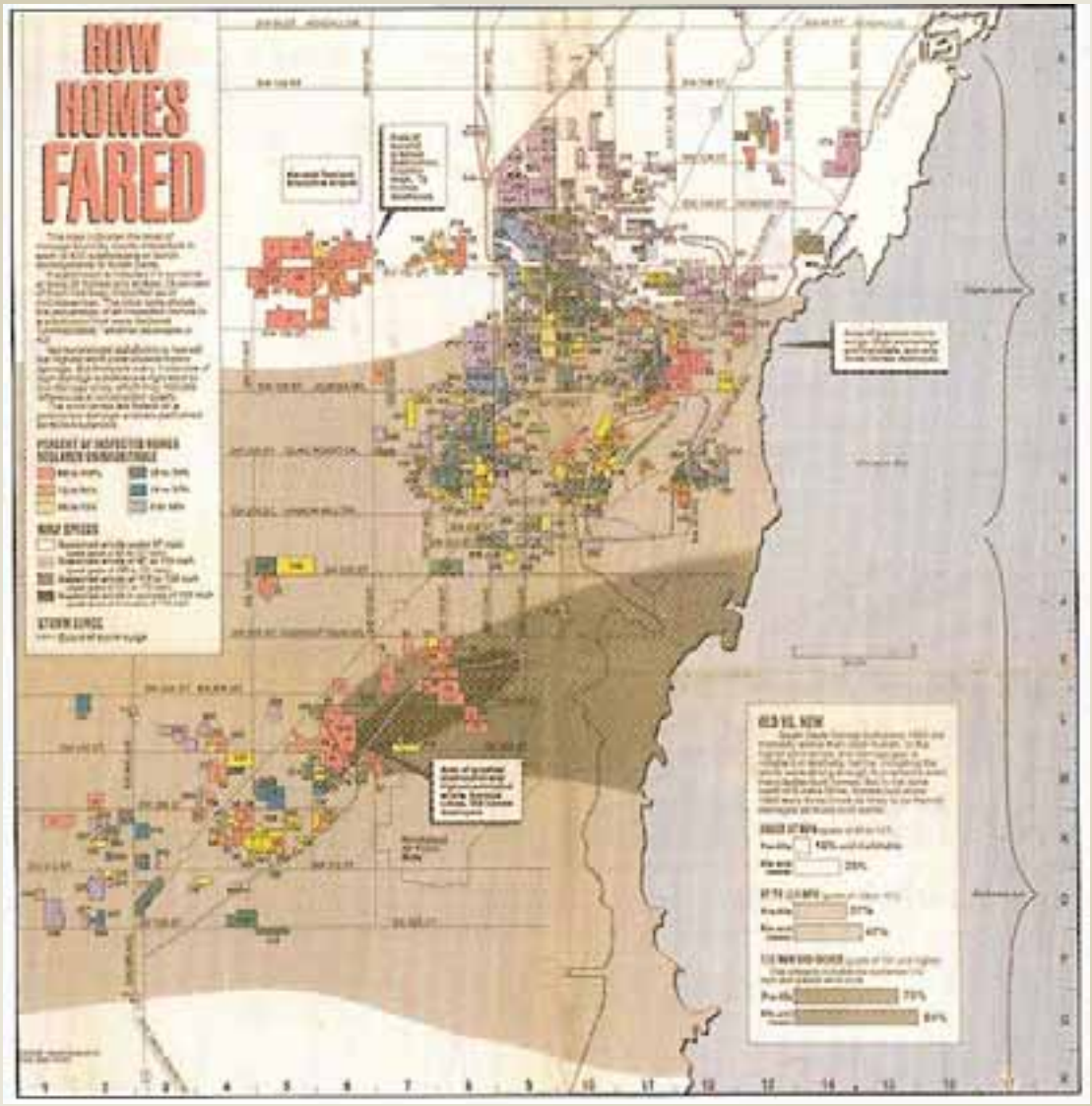
Fluency

- Brainstorming to avoid simply accepting the “obvious” explanation based on a set of assumptions or preconceived ideas.
- GIS encourages fluency by making different perspective displays – visual brainstorming – relatively easy.



Cognitive Skills Set

- The most basic goal of the unit is to teach students that not every explanation of the data is the best explanation and to provide them with strategies with which to discover the best explanation.


HOW HOMES FARED

The Case Study

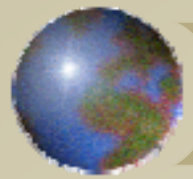
- In August 1992 Hurricane Andrew devastated the housing developments of Dade County south of Miami, Herald reporters used maps to explore, confirm and present the causes of the extensive damage -- $35 billion worth (Herzog, 2003).

The Case Study: The Question

- “Was the extent of the damage indeed an ‘act of God,” or were there any shortcoming caused by builders, inspectors, or government officials that put the homes at risk? GIS would play a key role in answering that question, and help launch a new avenue of inquiry for journalists” (Herzog, 2003, p. 14).

Querying Evidence

- The Herald reporter asked the obvious question: did the homes in the area of the highest winds sustain the most damage?
- He combined a wind contour map with data from damage inspections.
  - (Herzog, 2003)



Querying Evidence

- The map revealed some predictable information, but it also revealed some outliers in the data.

Conjecturing Alternatives & Fluency

- He mapped a few other factors that showed no clear patterns, but when he mapped the damage by the year each home or structure was built, he had a new perspective.
- Students need to explore the decision to map by year as product of fluency.

Inference to the Best Explanation

- Students are introduced to a set of criteria for evaluating an inference based on IBE (Lipton, 1991 as cited in Elfin and Elfin, 1999).
  - Consistency
  - Coherence
  - Explanatory power
  - Quality of the evidence

Inference to the Best Explanation

- The case study helps students to see how GIS reveals that the “obvious” explanation of the damage, the high winds, does not fulfill the first two criteria for evaluating an inference, thereby undermining its explanatory power and its quality as evidence.

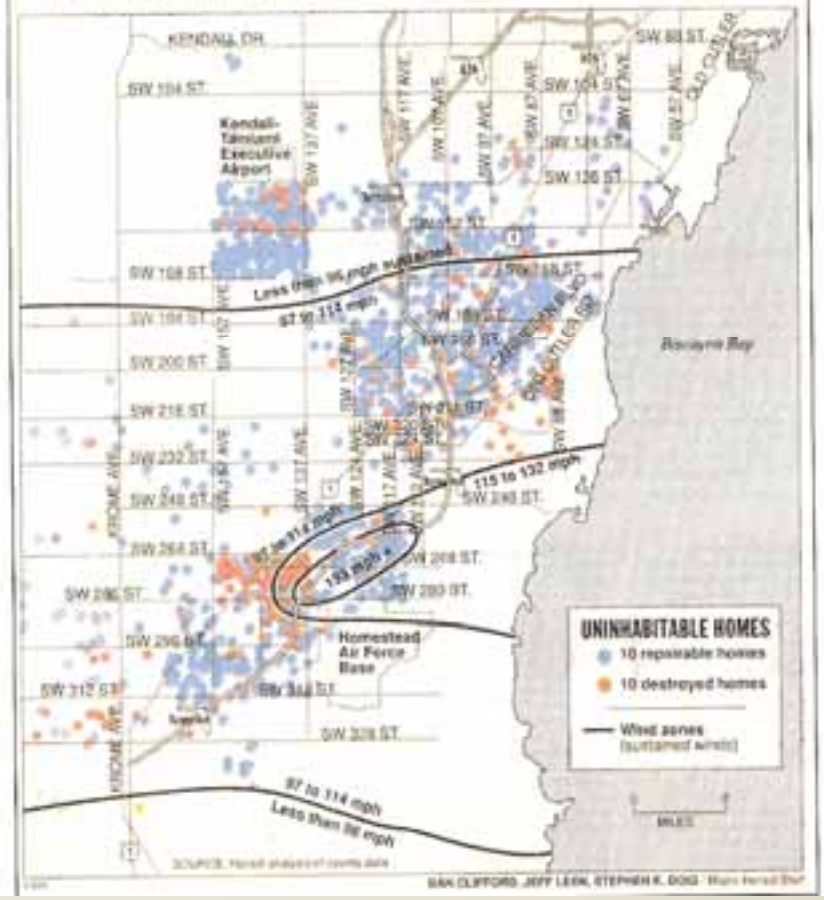
UNINHABITABLE HOMES

This dot density map indicates the number and approximate location of nearly 15,000 homes south of Kendall Drive declared "uninhabitable" by county inspectors in the weeks following Andrew.

The blue dots represent uninhabitable homes that were deemed "repairable." The red dots represent homes damaged so badly that they need to be demolished.

Notice the dot patterns in relationship to the wind zones on the map. For instance, in the area around the worst wind zone, the oval just north of Homestead Air Force Base, there is a heavy pattern of destruction, as would be expected.

But there also is heavy damage in the zone north of SW 168th St., an area where hurricane scientists believe the sustained winds stayed below 98 mph., well below the maximum winds specified in the South Florida Building Code.

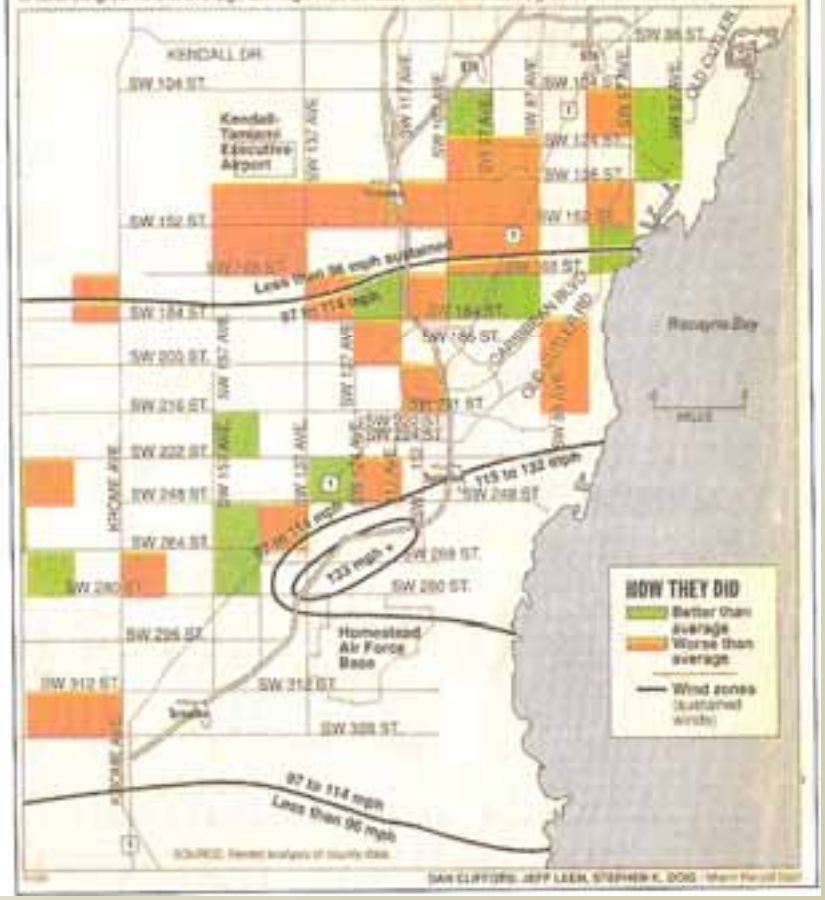


SOME BETTER, SOME WORSE

If homes built since 1980 were constructed like those built earlier, the average level of damage for both should be approximately the same. What this map shows is where homes built since 1980 were damaged to a significantly greater or lesser extent than those nearby.

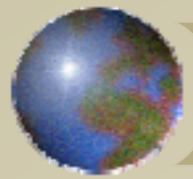
A square is colored red if the average damage to homes built since 1980 was at least 50 percent higher than average damage to all homes. A square is colored green if the average damage was at least 50 percent less than the average.

For instance, if there are a thousand homes in a specific square mile — including 400 built since 1980 — and half of all homes were uninhabitable, then 200 built since 1980 should be uninhabitable. This map shows only those square miles where the damage difference is at least 50 percent greater or 50 percent less. The square in this example would be red if 300 or more homes were uninhabitable, green if there were 100 or fewer.



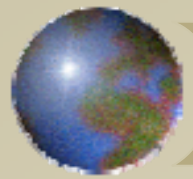
Fluency & Visual Brainstorming

- “Visualization is, first and foremost, an act of cognition (Miller 1984). It is a human ability to develop mental images, often of relationships that have no visible form” (MacEachren & Ganter, 1990, p. 66).



Fluency &Visual Brainstorming

- Maps prompt visualization of spatial patterns and relationships (MacEachren & Ganter,1990).)
- They are, as such, hypothesis generating and problem solving tools (MacEachren & Ganter,1990).



Fluency &Visual Brainstorming

- Computer-assisted reporting helps journalists identify patterns in data, and as one of the tools of CAR, GIS makes finding spatial patterns much easier.
- It also helps journalists explore alternative explanations to a spatial problem by mapping a variety of different variables.

Fluency &Visual Brainstorming

- Wolff (1988) suggests “visualization should not be viewed as the end result of a process of scientific analysis, but rather as the process itself” (cited in MacEachren & Ganter, 1990, p.).

Drawing Conclusions

- “GIS helped the *Herald* to show that, without a doubt, the devastation pattern was no ‘act of God,’ but the result of shoddy construction and lax regulation” (Herzog, 2003, p. 20).

Drawing Conclusion

- The case study helps to show students the valuable role GIS can play in using critical and creative thinking to discover the best explanation.

Drawing Conclusions

- The power of GIS as a critical and creative thinking tool makes it an excellent tool for teaching these essential higher-order cognitive skills.