Thinking Spatially with GIS

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Agenda

• Session goals and guidelines
• About spatial thinking
• Demos / examples
• Q & A
• Resources
Audience poll
Workshop goals

- Identify key components of spatial thinking
- Understand spatial thinking process
- Help you apply spatial thinking to your work
Guidelines

• Observe …
  - How we model spatial thinking and analysis
  - The tools we use

• Relate to …
  - YOUR OWN data and decisions
What is spatial thinking?
Demo: Your built-in locator
Spatial thinking combines …
- Concepts of space
- Tools of representation
- Processes of reasoning

To …
- Structure problems
- Find answers
- Express solutions
Gersmehls: Modes of Spatial Thinking

Brain science perspective

- Location
  - conditions, connections
- Aspects of spatial thinking
  - comparison, influence, region, hierarchy, transition, analog, pattern, association
- Spatio-temporal thinking
  - change, movement, diffusion
- Exceptions
Dr. Berry: An analytical framework for GIS modeling

Geotechnology approach

- **Geotechnology** (GPS, RS, GIS)
- **GIS** (maps, databases, map analysis)
- **Map Analysis** (spatial relationships and patterns)
  - Spatial analysis (geographic context)
    - Reclassify, overlay, proximity, neighbors
  - Spatial statistics (numeric context)
    - Surface modeling, spatial data mining
Why think spatially with GIS?
Advantages

• Uncover more efficient ways to solve problems
• Uncover other problems to grapple with
• Methods can serve as an example to others
• May lead to use of new tools, expanding your GIS skills
Effective spatial thinkers need …

- Geographic Perspective
- Content Knowledge
- Skills
Earth quiz

Scale
Perspective
Physical and cultural processes
Imagery vs. maps
Spatial pattern quiz

Reasoning process
Disciplinary knowledge
Classification
Symbology
Tornadoes & earthquakes

Temporal and spatial data
Representation
Scale dependency
Density vs. counts
Data source and quality
Boundaries

Lines vs. zones
Uncertainty
Mapping standards
Fitness for use
Truth in labeling
Metadata
Business locations

Patterns and relationships
Regional vs. national patterns
Community Analyst
ArcGIS Online
Site selection analysis
Population centers

Map projections and measurement
Change over time
Spatial statistics
Questions?
Developing as a spatial thinker

• Develop a habit of spatial thinking

• Use spatial data to construct, articulate, and defend a line of reasoning or point of view
  - Solve problems and answer questions

• Develop your skills
  - Deepen knowledge of spatial concepts
  - Expand knowledge of GIS analysis tools

• Be spatially critical
  - Evaluate quality of spatial data and validity of spatial arguments

• Expand content knowledge in your domain
• Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum, *National Academies Press, 2006*

• The ESRI Guide to GIS Analysis, Volumes 1, 2, and 3
  *Andy Mitchell, Esri Press. See esripress.esri.com*

• An analytical framework for GIS modeling, *J.K. Berry and S. Mehta, IJRS special issue on GIS modeling, 2009*
  *See innovativegis.com*

• Modes of Spatial Thinking, *Carol and Philip Gersmehl, in Wanted: A Concise List of Neurologically Defensible and Assessable Spatial thinking Skills, Research in Geographic Education, 2007*
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