



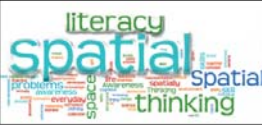

How Can We Reshape GIS Education to Serve Future Needs?

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6 June 2012


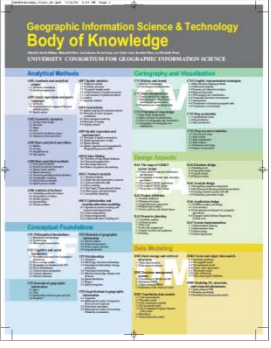



Outline

- Background
 - Geographic information science
 - Geospatial technologies
 - Web / Spatial 2.0
- Spatial literacy & spatial thinking
 - Fundamental concepts & linkages
- A spatially infused university
 - Teaching spatial science
 - Teaching spatial applications
 - Teaching spatial literacy
 - Workforce development
- Conclusions

Geographic information science

Geospatial technologies

- Provides tools to solve many of real world problems ...
 - Locating things
 - Routing
 - Location/allocation
 - Locating linear facilities
 - Land use modeling





Constraining Design Approach







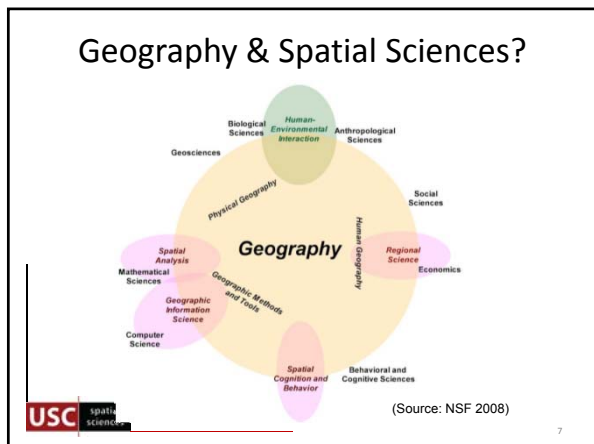

Web / GIScience 2.0

Multiple shortcomings

- Focus on what is or what has been
- Focus on terrestrial environments
 - Both reflect geography contributions
- Most of the world has been ignored
 - Oceans – cover 70% of Earth's surface
 - Buildings – people spend 85% of their lives indoors & dense urban areas have more interior space than land area
- Not well aligned with the non-expert user (& everyday places)
- Not connected to sketch & recording needs of design disciplines



Spatial literacy & thinking

- Spatial literacy
 - o Ability to use properties of space to communicate, reason, and solve problems
- Spatial thinking ...
 - o A cognitive skill that can be used in everyday life, the workplace, and science to structure problems, find answers, and express solutions using the properties of space
 - o It can be learned and taught formally to students using appropriately designed tools, technologies, and curricula
 - o A properly positioned GIS could be used to foster spatial thinking across the curriculum

Spatial concept terms

- Spatial structures
- Spatial properties
- Space-time context
- Positioning
- Spatial dynamics
- Spatial relations
- Spatial interaction
- Spatial transformation
- Representation
- Spatial principles

- o object
- o field
- o surface
- o network
- o region, etc.
- o position
- o distance
- o direction
- o orientation
- o spatial autocorrelation
- o spatial heterogeneity
- o spatial association
- o distance decay
- o access
- o availability
- o isotropy
- o congruence

Source: TeachSpatial (teachspatial.org)

Geography from a spatial perspective

A taxonomy of spatial thinking. Each of the 24 cells represents a unique characteristic in terms of three components of spatial thinking involved. For example, Cell 24 stands for a complex-spatial concept, use of a representation, and the output level cognitive process. Numbers were assigned for referential convenience.

From Is. I. and S. Baibars, 2009. Evaluating Geography Textbook Questions from a Spatial Perspective: Using Concepts of Space, Tools of Representation, and Cognitive Processes to Evaluate Spatiality. Journal of Geography 118, 4: 13.

Spatial / science teaching standards

Source: UCSB Center for Spatial Studies

A spatially infused university

- o Teaching spatial science – Maps & spatial reasoning, principles of geographic information science, etc.
- o Teaching spatial applications – Promoting and enabling spatial thinking across multiple disciplines
- o Teaching spatial literacy – Promoting and facilitating spatial approaches to thinking and reasoning about the Earth
- o Managing universities as spatially enabled enterprises – Facilities management, fund raising, public safety, etc.

Spatial programs at the University of Redlands

B.S. in GeoDesign ... as one example

- Goal
 - To identify the best and most sustainable designs that take into account livability (people), environmental impact (the planet) and efficiency (profit)
- Relies on an expanding foundation consisting of ...
 - An enabling technology (and science)
 - An emphasis on collaboration
 - An interest in interdisciplinary approaches
 - A renewed interest in livable cities and sustainability




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Spatial applications ...




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Teaching spatial literacy ...



- Target audience
 - The entire student body?
- Possible vehicles ...
 - A spatial studies minor
 - A series of spatially "certified" courses
 - A single "spatial" GE course
 - A single "spatial" course for non-majors
 - A series of "small" courses focused on specific technologies and application domains ... that may or may not be linked to courses on spatial theory




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Geographic information infrastructure

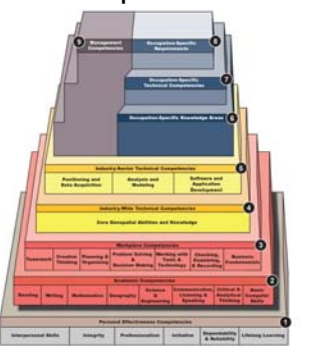

- Contains knowledge describing natural and human environments on Earth
- Includes multiple components
 - Data
 - Data models that provide structure to the data
 - Models and analytic tools that show predictions or suitability
 - Geospatial workflows
 - Metadata, which describes the aforementioned components, and is key to sharing, discovery and access
- Relies on web & mobile environments to make these ways of thinking about the world more accessible

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Workforce development

- Geospatial Technology Competency Model
 - Positioning and data acquisition
 - Analysis and modeling
 - Software and application development
- UCGIS GIS&T Body of Knowledge
- Los Angeles County

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Workforce development

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Questions ...

Project for
Public Spaces

Placemaking plans



City-wide
strategic plans



Capacity building
and cultural
change



Placemaking 101

Lighter

Quicker

Cheaper

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