SOME THOUGHTS ON GIS IN HIGHER EDUCATION TODAY

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GIS & Spatial Thinking in the Undergraduate Curriculum
Bucknell University
November 17, 2012
• Evolving K-12 educational outcomes

• Booming interest in “Spatial”

• Web-based maps and Data Magical Thinking

• a few models for GIS implementation
Revised curricular expectations
Revised curricular expectations
Revised curricular expectations

graphics that accompany “informational texts”

FedViews by the Federal Reserve Bank of San Francisco (2009)
Revised curricular expectations

revised National Geography Standards, 2012
Revised curricular expectations

**Geography Standard 1**

How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information.
Growth of “Spatial”
Spatial thinking is
the ability to visualize and interpret location, position, distance, direction, relationships, movement, and change, over space (Sinton, 2011a).

Growth of “Spatial”
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In order to fully participate in society, a spatial citizen should be able to:

1) access, read, interpret, and critically reflect on spatial information;
2) communicate with the aid of maps and other spatial representations;
3) express location-specific opinions using geo-media.

Growth of “Spatial”

**Specialist Meeting—**

**Spatial Thinking Across the College Curriculum**

December 10–11, 2012
Upham Hotel
Santa Barbara, California

**Objectives:**
There is now convincing evidence that spatial abilities are related to both success and participation in STEM disciplines. More generally, there is an increasing recognition of the importance of spatiality as a unifier of academic disciplines, including the social sciences, arts, and humanities, sometimes referred to as a “spatial turn.” But it is also widely acknowledged that spatial thinking is not fostered in our educational system and that current practice depends more on selection of the most able students for spatially demanding disciplines than on fostering the spatial intelligence of all students. This meeting will bring together cognitive scientists, disciplinary experts, and college administrators to examine how to best educate spatial thinking at the college level. An overarching goal will be to prioritize a research agenda to evaluate current approaches to spatial education, fill gaps in our knowledge, and consider how a curriculum in spatial thinking can best be implemented at the college level.

**Questions to be addressed include:**

- What are best current practices in spatial education at the college level?
- What is the role of technologies, such as geographic information systems and virtual environment technologies, in developing spatial thinking skills?
- Can we identify a set of general spatial skills that are relevant to spatial thinking across several disciplines?
- Are spatial skills best trained in the context of a discipline or in a

http://www.spatial.ucsb.edu/events/STATCC/
Fulfilling the potential of geospatial technology

Spatial thinking and geospatial technologies remain unrealized opportunities for much of higher education. For example:

- There’s now compelling evidence suggesting that spatial abilities prepare students for success in STEM coursework and early employment. However, no college or university includes such preparation among its overarching general education objectives.
- Despite the synthetic power of the spatial perspective, research discoveries too often remain segregated and hidden in disciplinary silos.
- For nearly a decade, the US Department of Labor has highlighted career opportunities associated with geospatial technologies. Still, relatively few higher education institutions offer advanced, practice-oriented educational programs to prepare students for such opportunities.

http://www.spatialroundtable.com/post.cfm?entry=envisioning-the-spatial-university
One Type of “Spatial”
One Type of “Spatial”

Five (5) Categories of Spatial Skills

1. Disembedding
2. Spatial Visualization
3. Mental Rotation
4. Spatial Perception
5. Perspective Taking

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http://serc.carleton.edu/earthandmind/posts/interdisciplina.html
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GIS & Geography in Higher Ed Today

Traditional venues:
- geography and geomatics
- planning
- natural resources management
- environmental sciences

Emerging venues:
- community colleges
- liberal arts & sciences colleges
- social science disciplines
- humanities disciplines
- Schools of Education
- Professional Schools (Business, Law, Medicine)
- programs in Intelligence, Law Enforcement, Security
GIS & Geography in Higher Ed Today

Dominant Reasons:
- the marketplace
- conducting research
- competition for students & between programs
- managing the business of the University

Secondary Reasons:
Enhancing teaching & learning experiences
- critical thinking
- quantitative literacy
- visualization & graphicacy
- service learning
- environmental sustainability
- spatial literacy
- use of 21st century technologies
GIS Specialists, affiliated with a Dept.

Geography Dept. faculty with expertise

Stand-alone GIS Center

Faculty leading class, fellow faculty as *students*, other students as support

Post-Bac Fellows/Staff

GIS Center, most strongly affiliated with one or more departments and/or areas of expertise

GIS Center part of Library & Information Services

Student Interns

Models of *Implementation* and *Support* and *Instruction*

Instructional Technologist with Former Expertise

Instructional Technologist with Assigned Duties and Emerging Expertise

Post-Doc Fellows/Staff

Grant-support instructor/researcher

Adjuncts

Local/community “expert” becomes adjunct
Web-Based Maps
Map Mashup: Jazz & Blues at UoR

Kathy Ogren, Johnston Center for Integrative Studies & History Department, UoR
Data Magical Thinking
Can we use GIS to map human consciousness?
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Connee Chandler created this image of the Paths of Mastery as a re-vision of Dr. David Hawkins’ Map of Human Consciousness from his book, Power vs. Force. David W. Gordon created the graphic design using PhotoDraw based on Connee’s description of what she saw in meditation, combining Dr. Hawkins’ Map with a rainbow medicine wheel symbol.
Student Scholarship
SILAS: Spatially Interactive Literature Analysis System

Map or Layer Name

Accuracy: the reliability of the map or layer content

Relative Reliability: How was the map or layer created? Was there a reasoning behind the selection and placement of the information?

Data Lineage and Reliability: How was the GIS data created? What problems remain in the data?

Who produced the GIS map or layer? When?
Who contributed to the map layer information? When?
Can other students email you with questions?

Example:
Name, Month/Year, email address, graduation year

Steve Benzek, MS GIS Cohort 12, 2008
Alyssa King, MS GIS Cohort 14, 2009
Peer review opportunities
New ideas for service learning

Standby Task Force

Events

- Add an Event

Task Force in the News

- CNN Article
- UN's IRIN News
- Washington Post
- Technology Review
- PBS Film Documentary
- UN Dispatch - Disaster 2.0
- Andrej Verity from OCHA talking about SBTF Libya Deployment
- Libya: how online mapping helped crisis response

Welcome to the Standby Task Force

The purpose of the Standby Task Force is to provide humanitarian organizations with real-time Crisis Mapping support. The Task Force is a volunteer-based network of trained crisis mappers who represent the first wave in Online Community Emergency Response Teams. The Standby Task Force was launched at the 2010 International Conference on Crisis Mapping (ICCM 2010). See this link for the original posting describing the vision for the Task Force.

SBTF Volunteers Coordinators

Anahi Ayala Iacucci
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Kirk Morris
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Roz Sewell
roz@crismappers.net

Getting Started

We're very excited to have everyone aboard and to begin organizing the teams. Over the next several weeks we'll be rolling out new features, components, and systems to strengthen the operation of the Task Force as well as announcing new deployments.

Here's what you can do to get started:

1. Fill Out Your Profile: Your profile will be used by team and deployment organizers to understand your background, skills, and abilities. Please take a few moments to describe the strengths you bring to the Task Force. Remember to add yourself to the Members Map.

2. Register For Teams: Decide which of the teams you are interested in joining and register for them.

Tasks

- Geo-Locations
- Humanitarian
- Reporting
- Media Monitoring
a Spatially-Infused Learning Community

Visualization, Communication

Spatial Analysis

Understanding Place

Glover, Lebu migration in Africa
Thorson, public policy analyses
Inland Empire Business Atlas
RUSD: Citrus Valley High School
Institute for Spatial Economic Analysis
Wuhs, globalization and local politics
McIntyre, biodiversity
Klooster, migration patterns
MS GIS
MBA, GIS Emphasis
Tilton, urban patterns
Malcolm, endangered species
Lyons, watershed modeling
Mitchell, school segregation
Larsen, early Christian texts and monasticism

MA Ed, Curriculum & Instruction: Spatial Literacy
Bernardini, archaeology
Sarkar, logistics networks
Glendening, forensics
expanded Business GIS curricula
GeoDesign
Mini-Mapping workshops
Stelle, marine mammals
Moenius, housing analysis

the Redlands Institute
Mapping People raises fundamental issues about space and place. Representing our dynamic and diverse human nature is a complex and intriguing challenge. What approaches do we have for bringing the dimensions of human experience into our digital mapping projects?

Traditional methods of data collection, such as censes and surveys, may be authoritative and comprehensive in their geographic coverage, but inadequate in their temporal scale. Mapping people from historical or antiquarian times relies on fragmentary records and traces that require extensive interpretation. In contemporary times, the advent of geo-tagged social media, and volunteered geographic information, have added rich layers that document cultural phenomena, but we have little control over their geographical extent and comprehensiveness.

Join us for the Mapping People Symposium to share your examples, and join the dialogue on how we map our human experience. The Symposium will be held Wednesday, October 31, 2012, at the University of Redlands, in Redlands, California.

The Mapping People Symposium is brought to you by generous support from the W. M.
Albert Einstein's scientific accomplishments so impressed the world that his name is shorthand for intelligence, insight, and creativity. To be an Einstein is to be inconceivably brilliant, especially in math and science. Yet Albert Einstein was famously late to talk, and he described his thinking processes as primarily nonverbal. "The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought," he once said. "[There are] more or less clear images." Research on his brain, preserved after death, has seemed to support his claim of thinking in spatial images: Sandra Witelson, a neuroscientist in Canada, found that his parietal cortex, an area of the brain involved in spatial and mathematical thinking, was unusually large and likely supported him in his innovative ways.

Einstein was unique, but he certainly did depend on his ability to think spatially. The discovery of the structure of DNA, for example, was about fitting a three-dimensional spatial model to early incomplete images of the molecule. The facts accurate must be grafted onto their ability to think spatially for a reveals to make grand discoveries. Geoscientists use spatial thinking to make sense of the formation of the earth. Engineers use spatial thinking to determine the outcome of a surgical procedure.

So, is spatial thinking really a key to science, technology, engineering, and mathematics—the so-called STEM disciplines? Yes.
GIS & Geography in Higher Ed Today

What is Spatial Literacy?
The confident and competent use of maps, mapping, and spatial thinking to address ideas, situations, and problems within daily life, society, and the world around us. (Sinton, 2011b)

Thanks!
Questions?

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