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Introduction to the topic of Spatial Learning/Literacy in Geography by Bob Bednarz:

In the recent past, we did not really discuss geographic literacy. Twenty years ago researchers were more concerned with knowledge and facts, not a way of thinking. Now we have a broader view of geographic literacy and the discipline of geography. To be geographically literate today one needs to be able to think spatially due to a number of reasons including the way one acquires information. Geography involves a spatial process from high tech to low tech. Now there are simple GIS interfaces online. This discussion is timely.

Geography includes, writing, spatial thinking, and citizenry

Joan Straumatis: Geography includes thinking in the abstract, understanding data, charts, graphs, representations of data, and diagrams.

Bob Bednarz: We have a flood of data, therefore we need more geographic representations of data. In geography one acquires these skills. Modeling is used.

Susan Gallagher: Different uses across disciplines and job markers. It involves thinking at scale. People that are not really geographers look for patterns and relationships/correlations. Is that a skill that many people should have? Yes. Another thing I'm hearing, in terms of national standards and updates for: K-4, 5-8, 9-12 ... What does the research show? Should there be a pre-K element in the standards?

Dedre Gentner: Pros/Cons discussed. A word of caution. There is evidence that different kinds of spatial language from parents make a difference. A study showed that in a two year period of time children do better (The study is not bullet proof—but gives us important information). The University of Chicago is about to do a study: How much spatial language do kids get? (... not correlational ambiguity). Susan Levine has also conducted research on this topic. SILC finds it astonishing. Low SES household use fewer words and types of words; this is the same with teachers with spatial language (words like north/south, up/down). Does this make a difference? ... Do not know yet. There is a similar study with mathematics. Laying the groundwork will pay dividends.

Bob Bednarz: GK-12 grant at Texas A&M University, investigates spatial thinking in (explicitly) middle school science and high school geography courses. Some teachers use more spatial language and others do not. The grant involves making the teachers aware and shows them that they make a difference using these spatial words/vocabulary. Of high school students, use of spatial words is low and this hurt them when trying to describe what they know/observed. We designed a flip book for spatial vocabulary to help students describe what they know/see. There is no pre/post test data; however, teacher word of mouth says that there is a big difference.

Alec Murphy: It is important to note the different ways/kinds of thinking of the meaning of spatial thinking. Typical Geography: Spatial thinking is not paper folding. It would be: directional things, wayfinding, etc. Spatial thinking is not common for students. For example, to determine how long coastline of Italy depends on scale. Students do not think this is correct. It is interesting to think about the potential connections. If our goal is “what is spatial thinking to geographic literacy,” then what does this mean? It is an open question. Having kids play with blocks may be a first way to get folks to understand space like a geographer does.

Bob Bednarz: A lot of work complains about the lack of research ...So if a child can mentally rotate objects, can they better understand wayfinding? This relates to Golledge’s third way of spatial relations/thinking. I think it is a collection of abilities/skills.

Dedre Gentner: This is a fun beginning exercise. Who studies the cognitive (SILC) side should list the kinds of tasks you do in your field. Geographers list should involve the tasks in their field. We should look for connections between cognitive science and geography.

Alec Murphy: Standards projects K-4, provides part of list on the geography side.

Susan Gallagher: Can’t address the deficit of skill at an earlier grade. Instead saying a student “can’t do” we need to realize it is a matter of scale. How do we increase complexity by scale or ability of analysis. Would addressing these skills by scale make sense?

Alec Murphy: What Dedre Gentner is suggesting is straightforward. What do we present to kids/what do we provide to make geographically literate (example: mapping exercise).

Dedre Gentner: At the K-4 level, the ability to interpret a map has been questioned. In a study, children performed an exercise which involved finding hidden objects in a long sandbox. Can a map help? With children at least 2 years old, the answer is yes. Judy Delouche: reasoning from a model to a room. To make skills/ability better, could be little seeds for geographic ability.

Bob Bednarz: Elementary school kids can understand an aerial photo relatively young. It uses an overhead perspective.

Dedre Gentner: Working at the environmental scale, wayfinding includes few tasks working at the environmental scale. Geographic reasoning, like other make mapping from representation to real work, spend a lot of time in the symbolic world. Geographers spend time on reasoning in symbolic/artificial world. Understand there is a mapping to the real world. You may think that

you think about the real world, but it is still abstract. By middle school we teach kids like they have already made transition to the symbolic world.

Bob Bednarz: Research people have trouble with symbols. Example: Fire station red. We need to know when there is the ability use complex symbology (age group).

Alec Murphy: To make a geographically literate child we are requiring him to think abstractly. Any time a person is looking at a map it is an abstract task. We are always asking what is hidden and what is revealed. More sophisticated geographic thought/analysis surrounded by images/representations where one needs to be able to think.

Bob Bednarz: Is remote sensing a map? ... No because a remotely sensed object is an image. A map one makes decisions what is on it--symbols, etc. Not just the scale, it is the complexity and sophisticated understanding of that scale/information.

Dedre Gentner: This is what is special about geographic thought: particular kinds of decisions/details maintained or gotten rid of. The clearest example: Engineers will take a transition to use from one place in another space. There is a distortion of the globe –it involves knowing and reasoning.

Alec Murphy: Geographic Literacy: Unlike models of representation of engineers, we're talking about what everyone is using daily—finding way around town, in business, ubiquity to maps and mapping –that give it a kinds of urgency.

Joan Straumatis: As soon as we use technology, we build in privilege, some skills / ability over others. Always when something is used, a skill is always left out (a choice). Why is an aerial photo not a map, because a map is an interpretation?

Bob Bednarz: A map purposely leaves out parts of the visual, a map does not include everything.

Dedre Gentner: There is systematic analogy on a map.

Joan Straumatis: Why is a sensing device not making choices?

Alec Murphy: When one looks at a map, one understands choices have been made. When one uses remote sensing one understand the remotely sensed image only shows what technology can; it does not show everything.

Joan Straumatis: Mapping a representation of some sort. A sensing device is always making a choice.

Bob Bednarz: When making a map, the person makes the choice.

Anjan Chatterjee: There is a different notion of literacy. Verbal literacy includes: who learns to read, how do they learn to write, and what constitutes good writing. Symbolic representations

(maps most obvious) rules for what makes a good map. It looks like this is a point of contact between cognitive psychology and geography. Red = fire house. Spatial cognition, natural kinds of symbols may inform how one might make better maps.

Bob Bednarz: Awareness influences effectiveness of making better maps. Is the kind of literacy the kind in neophyte geographers as compared to the public in general?

Alec Murphy: How narrow a slice is cartography? Are the rules to cartography a big jump to geographic literacy?

Phil Gersmehl: Not bad example, highlights the intuitive, geography colors have a different understanding from the average person.

Alec Murphy: It is important to think beyond cartography.

Anjan Chatterjee: Change to symbolic.

Dedre Gentner: Geography and visualization fields overlap.

Susan Gallagher: –More interested in perception and cognition, because now people have to understand; cartographers participated more in that kind of research.

Joan Straumatis: Do you take into account colorblind with map making?

Alec Murphy: Geographic literacy and spatial thinking: (in terms with what the parameters are) Geographic literacy is portrayed with map knowledge, some sense of how the world is organized, some sense of patterns, and the reasoning “the why” behind those patterns.

Dedre Gentner: Your “why” is not the same as a geoscientist.

Susan Gallagher: Can include social science reasoning as to “why.”

Alec Murphy: Asking why/where questions is key. A question is framed in that way can we see connections.

Anjan Chatterjee: Understanding the schematic notions, external representations, analogies – connections.

Susan Gallagher: Through the ages, geographic literacy involves the questions: What spatial thinking is expected in K-12 education and how it affects geography? —Perhaps these are areas of fieldbased research connections.

Bob Bednarz: Invisible map connections, why/where, need a map/representation of some kind.

Dedre Gentner: Maps give you the habit of thinking that way because of exposure—gives you prior knowledge.

Alec Murphy: 15/20 years ago we did use maps in the US. It has changed a lot. Technology has changed it. Eased ability to use maps.

Phil Gersmehl: Analytical complexity has gone the other way; it is much easier.

Bob Bednarz: There is a lot of information from the government in simplified in GIS ways.

Alec Murphy: In national intelligence agencies a generation ago, we dominantly organized information by topic and now we dominantly organize information by place. Changing the way we organize information has a huge impact on what we can do. Regular education –confronted with web-based programs.

Dick Boehm: International community: How does this fit with the world of geography's move away from regional geography?

Alec Murphy: Placed based referencing allows for the cross-referencing.

Dick Boehm: How does spatial thinking improve by use of manipulatives? —Impacts in professional development, in-service, pre-service—guidance ways to improve.

Dedre Gentner: Susan Levine, Lynn Liben, Nora Newcombe. Not completely settled that manipulatives help the most. It is not the smoking gun. Playing with blocks help children with a task latter.—It is helpful to talk about what you are doing.

Dick Boehm: Replace parent with teacher.(In regards to what a parent can do to help their child so, in many ways, can a teacher help their students.)

Joan Straumatis: Teach the vocabulary with the action.

Dedre Gentner: Concrete experience provides the beach head.

Anjan Chatterjee: In neuroscience manipulatives are very important—especially to multiple modalities and systems. Where things are may need the modification of “where” is really meaning “how.” For example, one needs to know where cup is because the person needs to know how to reach for it. Overlapping between reach and grabbing with where. Motor behavior in close behavior overlaps greatly with...

Dedre Gentner: Different ages depending on the complexity.

Anjan Chatterjee: Action verbs/prepositions. It's a gradient of concrete to more abstract representations. Plausible more concrete things have to be developed, in the brain and developmental patterns, matures the latest.