The Return of the Native? Questions About Geographical Knowledge and Spatial Thinking

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Abstract

The labor of Philip and Carol Gersmehl (2006) toward the development of a taxonomy of spatial thinking skills is commendable. Geography education serves to gain from the effort to apply innovative research, such as the latest in neuroscience, to the development of curriculum, instruction, and assessment in the field. As the Gersmehls point out, the assessment component of geography education has been weak. It is an unfortunate truth of schooling in America today that high-stakes standardized assessments have served to marginalize important subjects and experiences in K-12 schools. Educators in the social sciences, humanities, and fine arts have all found themselves arguing for the value of their disciplines. One of the commonalities of these disciplines is that their most cherished outcomes are often difficult to measure in a standardized assessment format. If the standing of geography is to improve in American schools, then attention to the presence of geography on standardized assessments is crucial. More important than mere presence on the exams, however, is the nature of the geographic knowledge that is tested. One rule of standardized assessment appears to be that *that which is measurable will trump that which is meaningful*. While it is true that measurability and meaningfulness are not mutually exclusive, geography educators nevertheless must take care to maintain the focus on meaningful learning outcomes in the struggle to increase the prominence of the discipline in K-12 schools. It is in the spirit of collegial academic discourse and a desire to ensure meaningfulness in geography education that I offer a few questions about the list of spatial thinking skills presented by the Gersmehls in *Research in Geographic Education*.

Is spatial- thinking a native ability?

In their article, Gersmehl and Gersmehl (2006, p. 31), stated that "Neurosci-ence research ... is unambiguous about two facts: the human brain does every one of these kinds of spatial thinking more or less automatically, and it begins doing so in very early childhood." This statement suggests that spatial thinking is a native ability and, perhaps, a cultural universal. If so, then spatial thinking would have a theoretical kinship with natural map learning theory as advanced by James Blaut. In an article elaborating his theory, Blaut (1991, p 55) stated, "The essential theoretical argument is this: mapping behaviour is carried out by all normal human beings of all ages in all cultures; it is therefore a natural ability, or habit, or faculty, 'natural' in a sense very close to the way language acquisition is 'natural'." Of course, the conclusions of Blaut and his colleagues have been challenged by those holding to other theoretical perspectives such as neo-Piagetian cognitive developmentalism (e.g., Liben and Downs, 1989), Vygotskyan socio-cultural learning theory (e.g., Wiegand, 2002), and dual coding theory from information processing psychology (e.g., Paivio, 1986). If neuroscience researchers are reaching the conclusion that spatial thinking is a native ability, then what are the implications for education? In what ways can this native ability be harnessed and honed through schooling? Are any of the other theories of learning relevant to the development of spatial thinking skills? If the purpose of developing a list of spatial thinking skills is to ultimately develop assessments of those skills, then the theoretical lineage of spatial thinking in education should be made explicit and the challenges posed by other theoretical perspectives should be addressed.

What is the role of language in spatial thinking?

It is very apparent that the Gersmehls have considered the influence of language in the development of their proposed taxonomy. The choice of terms to describe and categorize various skills was obviously made with great care. For example, the term *condition* was chosen over attributes, traits, and site characteristics. Similarly, the term *aura* was deemed to be more appropriate than buffer, halo, zone, or sphere of influence. In my opinion, the Gersmehls have made good choices in that these terms do indeed carry particular connotations that capture the essence of the thinking skill to be described. This process of term selection, though, reveals the constraints of the English language–or any language–to adequately convey the meaning of abstract con-

cepts. Furthermore, the terms chosen to convey these concepts are a product of the ways in which one's language influences the construction of one's thinking processes.

English speakers, for example, use the demonstratives here, there, this, that, these, and those to refer to the spatial position of items or people. Spanish speakers use similar terms, but have additional words that convey shades of meaning not as easily communicated in English. A Spanish speaker refers to something here as *aquí* and something there as *ahí*, but she may also refer to something that is "in this general area" or "near here" as *acá* and something "over there" as *allá*. Similarly, this, these, that, and those are translated in the masculine form in Spanish as *éste*, *éstos*, *ése*, and *ésos* respectively. Yet, a Spanish speaker may also refer to something more distant in space or "that over there" as *aquél* and "those over there" as *aquéllos*. Thus, Spanish speakers have a more specific vocabulary for referring to spatial relationships. This may be true of other languages as well.

When one attempts to learn a foreign language, he or she is frequently confronted with circumstances that reveal the influence of language on our ways of thinking about the world. To what degree do these language differences influence spatial thinking? Neuroscience research in this area may have much to offer teachers as curriculum, instruction, and assessments are developed for advancing spatial thinking abilities. If such language differences do not impact spatial thinking significantly, then the case for spatial thinking as a native, cultural universal may be stronger. At the very least, foreign language teachers may be called upon to assist in the teaching of spatial thinking.

What geographic knowledge should be assessed?

Most geographers cringe at the common notion that geography is about memorizing capital cities and spouting off superlatives such as the longest river or the tallest mountain. One advantage of such factoids is that they are easily assessed. The meaningfulness of such a geography assessment, though, is dubious. In recent years, the widespread dissemination of the five themes of geography has helped to expand the conception of geography beyond place-name recognition and geo-trivia. Geography teachers who have absorbed the meaning of the five themes have begun to incorporate into their instruction many of the proposed spatial thinking skills. The concepts of site, situation, and region, for example, would be familiar to a five-themes-oriented teacher. The assessment of students' understanding of the five themes is not difficult, but it requires more creativity and thought than a multiple choice test over capitals and superlatives.

Assessments based on the five themes are much more likely to capture meaningful forms of geographical knowledge than those based on a geo-trivia approach to geography education. Similarly, assessments based on a new taxonomy of spatial thinking skills could produce meaningful measures of students' geographical understanding. Such assessments, though, must be constructed creatively and carefully so that they probe for understandings that are significant outcomes of geography education.

While I recognize that the figures in the Gersmehls' article were designed to illustrate concepts, I can imagine an assessment based on these figures that would test students' abilities to distinguish relationships between dashes, dots, and gray circles. In my opinion, this would not represent a meaningful outcome of geography education. If spatial thinking skills are to become an assessed component of geography education, then great care should be taken to integrate the aspects of spatial thinking into real-world contexts so that curriculum, instruction, and assessment are based on meaningful geographic knowledge.

In Need of a Holistic Theory of Spatial Learning in Geography Education

Public interest in topics such as globalization, conflict between ethnic and religious groups, and global climate change is very high at this moment in time. Geography educators could seize upon this interest to demonstrate how geographic knowledge and skills are vital to understanding the dynamics of the social and physical world. Spatial thinking should have an important role in this discussion, but it is only a piece of a larger picture. To use a GIS metaphor, there is a need to zoom out to view a larger space. I have raised a few questions about the theoretical underpinnings and implications of the neuroscience research on spatial thinking, the influence of cultural factors such as language on spatial thinking, and the importance of maintaining emphasis on meaningful outcomes in geography education. The Gersmehls did not have the space within the constraints of a journal article to fully elaborate on topics such as these. A more lengthy treatment of this topic based on research findings and theoretical perspectives from a variety of disciplines is needed in order to advance a holistic theory of spatial learning in geography education. Such work could lead to a new generation of research in geographic education.

References

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Frames of Reference

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> "This is not to say that the concept of location is unproblematic; in fact, it turns out to be remarkably difficult to describe a location without invoking at least one other "spatial primitive" such as distance, direction, topology, or enclosure."
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> Gersmehl and Gersmehl, (2006)

Introduction

Understanding the complex web of spatial thinking skills necessary for functioning in a spatial world is an important next step. In order for geography to progress towards incorporating such thinking skills into instruction and assessment in education, we must understand spatial thinking in a systematic and organized fashion. In presenting their taxonomy the Gersmehls have provided a starting point. In order for this list to evolve into a true taxonomy the interconnection among different spatial skills must be established as do taxa (subgroups) from taxon (group). Perhaps considering a spatial thinking skill that is germane to most of the taxon presented would be a good starting point. This commentary will argue for the importance of frames of reference for guiding the interconnectivity of spatial thinking skills as well as a possible starting point for the establishment of subgroups within each spatial thinking taxon.

Spatial Thinking Skills Discussion

Notwithstanding the essential nature of what is being pursued in the Gersmehls' work it is important to critically examine the fundamental basis for their taxonomy of spatial thinking skills. Just as others have done before them the "primitives" of space (in the Gersmehls' case, spatial thinking primitives) have as an important foundation the concept of location or movement (Nystuen, 1963; Golledge, 1993; Chatterjee, 2001). The latter is gen-