Spatial Thinking and Reasoning Across the Curriculum

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One of the great dichotomies in the anecdotes of education is between those students who are more math/science oriented and those who are more language/humanities oriented, and these kinds of distinctions appear to begin very early. As a scientist interested in individual difference in spatial cognition, I find that there is a general impression that my work is mostly (if not only) relevant to the former category of math/science learners. However, spatial reasoning can be found in nearly every discipline: organic chemists visualize isomers, writers organize words and sentences into coherent paragraphs, artists capitalize on 2D cues to offer the impression of 3D structures, and the list goes on. One of the challenges for scientists and educators alike is to come to grips with whether, when, and how spatial intelligence might serve as a common thread not only for education within a discipline but as a tool for developing broader ways of thinking.

My work has largely focused on the basic science of spatial learning and memory. By necessity, this work evolved from studying the general organizing principles of spatial memory and learning processes to investigating individual differences in a wide range of spatial skills. A large part of my focus is on how individuals differ not only in how well they learn, remember, and utilize spatial information but also in the styles, strategies, and profiles of spatial skills that they bring to bear on spatial problems. This area of work has naturally led to thinking about (1) how spatial skills develop (in childhood and through training), (2) how spatial skills interact, and (3) how different profiles of spatial skills might shape different types of learners. These questions have resulted in new lines of research that include spatial skill interventions for specific populations in college and in younger children. As such, the workshop has a direct relationship to current directions in my own research.

In addition to my research agenda, I have long been an advocate for educational outreach and have used my science as a tool for teaching high school students (and younger) about what it means to be a scientist, to ask questions, and to solve problems. In this capacity, I have become very interested in what it means to offer a STEM education and what evidence is still needed to make the case for stating that such an education will benefit individuals across a wide range of disciplines. To that end, I have begun working with a committee on K-12 STEM outreach at Johns Hopkins, and one of the fundamental questions we have been trying to answer is how to think about STEM as an approach that can be integrated into a curriculum. I would argue that spatial skills offer one of the clearest examples of a skill set that can be applied across many different fields, and this workshop is designed to essentially address this broader question at every level from the basic science to the implementation. With the current focus among educators, boards of education, funding institutions, and scientists on the importance of...
STEM education, it seems that now is the time for this comprehensive approach to articulating the role of spatial intelligence in both the STEM fields and in bringing the principles of a STEM education to other academic and practical domains of knowledge. In addition, the workshop will foster the much needed cross-talk among the principal players at all levels from the scientists up to the educators and administrators who could implement evidence-based changes. I would be delighted to have the opportunity to participate in such a rich and timely discussion.