Spatial Thinking Across the College Curriculum

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I have been using and teaching about geospatial technologies and spatial thinking for almost twenty years with a broad audience including K-12 students, pre- and in-service teachers, undergraduate students, and Master’s students. I’m currently directing a large dual-enrollment program with high schools in Virginia, wherein students learn about geospatial technologies and develop spatial thinking skills as they pursue locally-based projects (and earn college credit for the experience). With the support of the NSF-funded Spatial Intelligence and Learning Center, and in collaboration with Dr. David Uttal and colleagues at Northwestern University, we are conducting a research study to determine the extent to which the use of these tools impacts students’ spatial thinking skills. I’ve also co-authored or co-edited four books (one in production) of geospatially-focused collections of activities. I’m currently serving as the Interim Dean of the College of Integrated Science and Engineering and as a member of the Geospatial Task Force at James Madison University

Perspective: I give the background above to provide some context for my remarks. Much of my work has been focused on the geospatial aspects of spatial thinking and the case has been made by many for its value across the curriculum. I support that line of thinking and have been an active advocate on my campus for broadening the reach of geospatial technologies primarily in General Education classes so that geospatially-based thinking and analyses can be made available to a much broader range of students. In my new position as Interim Dean, I have the Geographic Sense program under my purview and I’m hoping to get more traction in developing a broader audience for this aspect of spatial thinking. As a part of my work on the JMU Geospatial Task Force, I’ve offered workshops to faculty members across campus to introduce them to these technologies and spatial thinking so that they might then engage their students. As a Task Force, we’re brought together faculty from STEM disciplines and the Liberal Arts to facilitate projects like a digital Geospatial Commons to share and archive data. However, more clearly needs to be done to increase the reach of this genre of spatial thinking.

While this meeting is focused on the tertiary level, I don’t think we can ignore K-12 education. What preparation do we need to provide pre- and in-service teachers to help them build their students’ spatial thinking skills? What about students that have a rich set of spatial experiences in high school (like my Geospatial Semester students) – what opportunities might they need when they get to college (this is not just a theoretical question – the Geospatial Semester is seven years old and has sent ~1,500 students to higher education having already had a strong exposure to geospatial thinking skills).
I also serve as the Interim Head of Engineering and so have curricular responsibilities in that area as well. Engineers typically focus on a different kind of spatial thinking (working in 3-D, visualizing and mentally rotating 3-D figures, etc.). I’m an advocate for this kind of spatially thinking as well, especially with the increasing importance of 3-D printing in engineering design and manufacturing and the work of Wai, Lubinski and Benbow on the importance of spatial thinking skills to STEM success. We are still in the early stages of the development of our Engineering program (we’re just four years old) and I’ve been encouraging faculty to consider how to build relevant spatial thinking skills. This particular set of spatial thinking skills tends to have less relevance across the curriculum, but they are important within a number of the STEM disciplines.

I have a number of questions that arise both from my own work and my observation of the work of others in this area. Perhaps some of these questions might get addressed in the meeting.

- It would be nice to have a community consensus on the definition of spatial thinking in these contexts that we can use to communicate the value of spatial thinking to the various interested parties. Do we have such a consensus definition?
- What strategies exist to spatialize (and keep spatialized!) the broader curriculum? I’ve watched Sinton’s efforts at U. Redlands and the UCSB work, but the broad reach across campus of both of these efforts seems somewhat limited.
- What’s the case to be made for administrative buy-in to broadly spatialize the curriculum?
- How do we assess our efforts and by what measures do we declare success (or failure)?
- How do we maintain faculty buy-in and spatial thinking skill sets in the midst of an increasingly transient faculty (note this is an issue in K-12 as well)?
- What’s the goal of our efforts—everywhere/all the time or focused areas/as needed? Different stakeholders seem to have different opinions.
- What does the online environment offer in terms of activities to build the reach of spatial thinking across the curriculum? Do we have the right tools to support the different genres of spatial thinking?

As you can see, I have many more questions than answers, but I think my experience does have some relevance to this topic and I would enjoy the chance to participate in a discussion on these questions and others surrounding this topic. Thank you for considering me as a participant for this meetings.