In considering the plan for this Specialist Meeting, and the action agenda we are seeking to delineate, I think it is interesting to reflect on a prior report on an allied issue: the curriculum prior to college. *Learning to Think Spatially* (2006) was a landmark achievement, making a persuasive case for the importance of spatial thinking and its inclusion in K-12 education. It has succeeded in bringing spatial elements of education to the attention of researchers, policy makers and educators. I want to highlight three points about this report that seem to me relevant to the current meeting.

First, one of its key conclusions appears questionable in retrospect, namely the argument that spatial training of one skill rarely transfers or generalizes to other skills. Uttal, Meadow, Tipton, Hand, Alden, Warren and Newcombe’s (2012) meta-analysis of this question (and other questions concerning spatial training) gives substantial reason to be optimistic about the generalizability of spatial education. However, note that we were only able to evaluate near and moderate transfer. Whether or not far transfer is feasible has not really been evaluated, and should be on the agenda for future research. Similarly, although we found evidence that training effects have some durability, the longest time intervals tested have been on the order of months, not years. Thus, we are missing some of the evidence we would like to have to plan and advocate for a college curriculum. We don’t really have an answer to the question: *If a student is taught to imagine cross sections in the context of a geology course, does this skill transfer to imagining sections in engineering or biology?* In addition, the data base for the meta-analysis was too sparse to give a fine-grained answer to the question: *What is the role of technologies such as geographic information systems and virtual environment technologies in developing spatial thinking skills?* Some of the papers we reviewed used these technologies, and they seem to work. But we couldn’t examine, how well, in comparison to what, for whom, or other more fine-grained questions. Research and educational policy will need to proceed in tandem.

Second, another conclusion of *Learning to Think Spatially* was that spatial thinking should not be a separate subject in K-12 education, but that instead, we should look to spatialize the existing curriculum. Within the context of the crowded day of the average American school, I think this plan is the only way to go, although informal education in preschool, after-school, museums and camps can perhaps take a different (and more direct) route. But college curricula are very different from K-12, allowing for substantial amounts of variety and student choice. So clearly we could offer a “spatial track” at the college level—but should we? Such an agenda seems to me quite different from supporting spatial thinking in existing disciplines such as geography and geoscience, entailing different pedagogical strategies and having quite different
implications for the organization of a university. In the “spatial track,” we seek to modify learners, making their spatial thinking more powerful. In teaching current curricula (and we should also include the other STEM disciplines), we may seek to modify the learning materials to make them more spatial, or their spatial content more accessible and transparent. I have discussed these two routes in a short commentary recently (Newcombe, 2012). Both ways of proceeding seem to me to have praiseworthy, but quite different, objectives. How can they be coordinated? Do they even need to be? I look forward to discussion of the inter-linked questions: What are the connections between “spatial thinking” courses and curricula organized for disciplines? What are the administrative challenges and opportunities for implementing spatial thinking programs at the college level?

Third, Learning to Think Spatially never really settled a question that has haunted the field of spatial cognition for a hundred years, and that no one has yet settled (for an overview of the history, see Hegarty and Waller, 2006), namely what typology of spatial skills makes sense? SILC has been using a typology that sharply divides thinking about objects from thinking about the environment, and that also distinguishes static representations and dynamic transformations within each type of spatial thinking. Thus, I think we can identify four component skills in answer to this question: Can we identify a set of domain general spatial skills that are relevant to spatial thinking across several disciplines? This typology also provides the framework I would advocate in response to this question: What are the learning outcomes for spatial thinking curricula, and what form should assessment take?

References:


