Teaching & Learning with Data:
The Long Trajectory from Nursery School to Professional

Kim Kastens

In my mind, the most important reason for teaching science with scientific data is so that students will grow up to be citizens with the skills and disposition to make evidence-based decisions in their personal and professional lives. If this our motivation, we need to plan out an educational trajectory that will bring students all the way to the point that they can make meaning from large, complex datasets that they did not collect themselves.

I envision this trajectory as passing through four stages or domains: (A) young children exploring the world in an unstructured way with their human senses, (B) students working with small datasets that they collected themselves, (C) students working with large, professionally collected datasets around well-structured problems, and (D) students and adults working with large, professionally collected datasets around ill-structured problems. Each phase has its own affordances and pitfalls, and the transitions between phases seem particularly challenging.

The talk will drill down into this trajectory at three points. First, we will consider what precursor skills and understandings young children need to construct through life experiences so that they will be prepared to interpret data later on. I use the example of understanding that events in the world leave traces, and that by observing the traces we can sometimes make inferences about the events. Second, we will look at the transition from small, student-collected datasets to large, professionally collected datasets. Many things change across this transition: the size and complexity of the dataset, the interpreter's knowledge of context and method of data acquisition, types of necessary tools and techniques, etc. My colleagues and I have assembled a suite of teaching strategies that we think can scaffold students across this transition and leverage the expertise they have built up in their work with self-collected data. Finally, we will look at the skill set and understandings of big-data-enabled professionals, individuals who make a living wresting insights from complex datasets. This part of the talk draws on an occupational profiling effort that my EDC colleagues and I undertook with an expert panel of such professionals. The duties and tasks identified as crucial by the experts will be compared and contrasted with the data-related performance expectations of the Next Generation Science standards to get a handle on what else needs to happen as students pass through the final transition of the envisioned trajectory.