Using Learning Trajectories to Unpack and Interpret the Common Core Math Standards

Background

The state-led Common Core State Standards Initiative represents the leading wave of a sea change in public education aimed at putting United States education and students on par with those of leading countries—intensifying educational standards, improving coherence among the state education systems, improving instruction, and developing and deploying new approaches to curriculum and in-class and summative assessment. Educators across the country are discovering that the *Common Core State Standards for Mathematics* (CCSSM) represent major changes from "business as usual": fundamental changes in depth of content, as well as earlier introduction of major blocks of content, compared to previous state standards. The need for sustained coherent professional development to support CCSSM implementation is widely acknowledged.

The CCSSM are based on the concept of learning trajectories (LTs)/progressions—using LTs to support instruction and standards. They offer a rare large-scale opportunity to focus on improving the "instructional core" through emphasis on conceptual growth across the grades, and linking learning research to instructional practice. LTs lay out paths by which student reasoning builds to increasingly sophisticated levels. Beginning with students' prior knowledge, they are most important for identifying the intermediate states of understanding that students are likely to traverse, through instruction, on the way to achieving rich goals of mathematical understanding.

The Turnonccmath project is a response to the urgent need to interpret the CCSSM within a LT framework. Drawing on our research team's experience in student learning research and in developing and representing LTs and standards, we have created a set of learning trajectory-based resources aimed at teachers, professional development staff, and teacher educators.

In turnonccmath.net, we identify 18 LTs to cover all the K–8 CCSSM. The LTs are mapped onto the CCSSM hexagon map developed by J. Confrey, A. Maloney, and the GISMO research team of NC State University. Each of the 18 learning trajectories for the CCSSM is accompanied by a detailed *descriptor* document containing a structural overview of the LT, the full set of standards for that LT, and descriptors that "unpack" the standards into the learning trajectory, using several elements:

- *Conceptual Principles* pertaining to the standards topics within an LT
- *Student Strategies, Representations, and Misconceptions*
- *Meaningful Distinctions* among different closely-related topics, representations, and concepts, and *Multiple Models* for approaching problems and tasks
- *Coherent Structures* of related sub-topics or repeating themes of the LT
- *Bridging Standards*, where necessary, to support transitions between standards that were not specific or detailed enough to support instructional implementation of some standards in the CCSSM

At presentations and professional workshops for audiences that have included teachers, school principals, and state curriculum supervisors, Turnonccmath team members have encountered a uniformly enthusiastic response to the resources we currently have available. With 10 or 15 minutes to explore the site, workshop participants have responded that the site is easy to navigate, rich with information, and comprises resources that they intend to use repeatedly in their instructional preparation or professional development presentations.

The highly positive reception to the current version of turnonccmath.net demonstrates the potential usefulness of these resources across the community. We are now extending and deepening turnonccmath.net's resources. A major aim is an iterative improvement model, through which the usefulness of the turnonccmath.net resources can be improved to meet particular implementation support needs (for teachers, professional development, and teacher educators) through a combination of Web analytic and face-to-face approaches (currently under development). The suite of resources will eventually include (1) stand-alone presentations (both PowerPoint and video) for use by any interested educators, (2) customizable lists of research and practitioner references, and (3) student work examples mapped to the LTs and standards.

For More Information

See turnonccmath.net to explore the current version of resources available.
Contact Alan Maloney (alan_maloney@ncsu.edu) for further information about project progress, and to discuss participation in user group evaluation of the resources.