

## ***The Curious and Crucial Mathematical Knowledge for Teaching***

Good teachers know both content and how to “get it across” to their students. But specifying this knowledge has proven surprisingly difficult. A common approach is to require teachers to major in the fields they will teach and then add knowledge of how children learn and classroom experience. But some argue that the content knowledge that teachers need is different from that needed by mathematicians. (Something as apparently simple as what knowledge is involved in teaching operations with integers. Most adults remember a “rule” for subtracting negative numbers — “subtracting a negative is the same as adding a positive.” Is knowing this rule enough to teach this material? Note that this isn’t the same as asking what students need to learn. Rather, we ask about the mathematical understanding needed to teach this topic).

**Modeling Mathematics in Teaching** One of the most easily observable teaching tasks is constructing representations that are both mathematically accurate and helpful to learners.

**Teachers’ Mathematical Knowledge** What must teachers know and be able to do? Despite years of research and a wide variety of methods for measuring teacher knowledge, the answer to this question has been surprisingly elusive. Some have used teacher certification as a simple proxy measure for teacher knowledge and quality (Ball and Hill 2008). Only a handful of these studies show that high school teachers certified in mathematics produce somewhat higher student gains than those certified in other subjects. Many studies, some at the elementary level and some at other levels, show no effects of teacher certification on student outcomes.

## ***Developing Mathematical Knowledge for Teaching (MKT)***

How do teachers develop and use MKT? Strong MKT seems to correlate with certain habits of mind, such as careful attention to mathematical detail and well-explicated reasoning, as well as agility with a variety of mathematical productions from textbooks and students. In other cases, teachers report developing their own knowledge through extensive mathematics-focused professional development.