[Curriculum Examination]

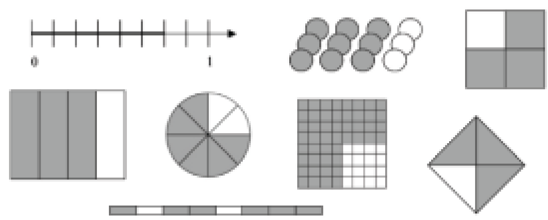
Examine Curriculum Materials and Fractions Models

> *Researcher: Which fraction is smaller? $latex \frac{6}{4}$ or $latex \frac{6}{5}$*
>
> *Chris: $latex \frac{6}{4}$. Because 4 takes longer to get to 6 than 5 does.*

Like Chris, many students reason about fractions in ways that work in certain situations but not in others. Chris may have an image of a fraction as a quantity less than one and as a number of pieces in a whole with some missing. His reasoning would be helpful if he were comparing the size of $latex \frac{4}{6}$ and $latex \frac{5}{6}$, but leads him to the wrong conclusion in the example above.

Students' images and understandings of fractions are shaped by their encounters with mathematics textbooks and materials and by real life experiences. What images of fractions do your students typically draw when asked to make sense of a fraction problem? The illustration below shows the fraction $latex \frac{3}{4}$ shaded in eight different models.

Figure 3. Models of the fraction $\frac{3}{4}$



As Tad Watanabe's article [“Initial Treatment of Fractions in Japanese Textbooks”] notes, each of these models has different strengths and shortcomings for building student understanding, and there is not one single “best” model. Ultimately, students will need to understand that $latex \frac{3}{4}$ represents several very different situations, such as $latex \frac{3}{4}$ of a meter, 6 out of 8 squares colored on a checkerboard, and 3 girls in a group of 4 children. The resources here focus on the linear measurement context for fractions because it is often neglected in U.S. textbooks, although it is common in other countries and in research-based programs.

At the Summer Institute, we began to explore the linear measurement model with a hands-on activity involving a meter-length strip of paper tape and a mystery-length strip of paper tape (colored blue).

- *Without* using standard measuring devices, express the length of the mystery piece (a fractional part of a meter) in meters. How might students solve the problem and what they might find challenging? What understandings of fractions would help students solve the problem?

Examination of Curriculum Materials

- Read over [“Fractions”] (pp. 57-64 of the Grade 3B Tokyo Shoseki textbook, 2006). It may be useful to know that 8 periods of 45 minutes are allocated for this unit, roughly one period per textbook page.

- See non-unit fractions (fractions with a numerator other than 1) as accumulations of unit fractions (fractions with numerator of 1)?

- See the connection between whole numbers and fractions?
- Connect area, linear measurement, and number line models?

- Consider: How do the images and understandings of fractions that students might develop from the 3B textbook compare with what students might develop from your own curriculum's introduction of fractions?

If you like this activity and want to do more of it, you can analyze the 4B Fractions Unit (pp.38-51) in the same fashion.

Record any key learnings from examining the curriculum in sections 2-5 of the unit plan template, to capture your thinking about unit flow and rationale.