Modifying Children's Mathematical Tasks for Use in IBL Content Courses for Prospective Elementary Teachers

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Why use children's tasks in an IBL course for prospective teachers?

- Opportunity to incorporate authentic tasks into the course (Newman, King, and Carmichael, 2007) that can develop their mathematical knowledge for teaching (Ball, Thames, and Phelps 2008)
- Modified children's tasks can provide prospective teachers with "experiences similar to those children encounter and for which the [prospective] teachers could not draw on familiar knowledge" (Yackel, Underwood, & Elias, 2007, p. 354)

Analyzing a children's task

Consider the children's task on p. 2 of the handout packet…

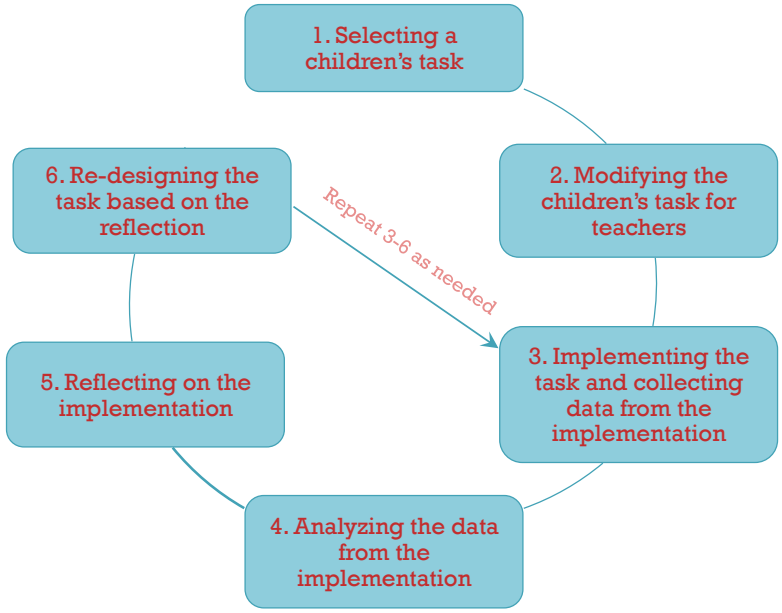
- What mathematical ideas does this task have the potential to elicit for children?
- What mathematical ideas does this task have the potential to elicit for prospective elementary teachers?
- What would you need to consider and/or plan for, if using this task with prospective elementary teachers?
  - In what ways would you modify this task for prospective elementary teachers? Why?

What mathematical ideas are elicited by the children's task?

Connecting to the Common Core State Standards
http://www.corestandards.org/Math/

Problem	Strategies elicited	Connections to CCSS
1. 7/10 or 3/5	Same-Size-Pieces (i.e., Common Denominators)	3.NF.3d 4.NF.2
2. 7/8 or 9/10	Combination of Strategies: Comparing to Benchmark (of 1) and Same-Number-of-Pieces (i.e., Common Numerators)	3.NF.3d 4.NF.2
3. 4/3 or 3/4	Comparing to a Benchmark (of 1)	4.NF.2
4. 3/8 or 1/3	Same-Number-of-Pieces (i.e., Common Numerators)	3.NF.3d 4.NF.2

Task Design Cycle



+ Our overarching goals: For prospective teachers to develop reasoning and sense-making strategies for comparing fractions and strengthen their fraction number sense

Ensure a high level of cognitive demand
(Smith & Stein, 2011)

Provide opportunities for PSTs to develop MKT
(Ball, Thames, & Phelps, 2008)

- Encourage teachers to seek alternative strategies by making their familiar procedures more difficult to apply
- Encourage solving problems in multiple ways
- Include problems that may elicit misconceptions that are documented in the literature on children's knowledge (e.g., applying whole-number reasoning)
- Provide opportunities for problem posing as well as problem solving

Example of our modifications: Modifying a children's item

For children:

7/8 or 9/10

For prospective elementary teachers:

8/9 or 12/13	*Discourages use of fraction strips*
13/15 or 17/19	*Less than benchmark by 2 "pieces" rather than 1*
25/12 or 31/15	*Greater than benchmark by 1 "piece"; Benchmark other than 1*
11/20 or 19/36	*Greater than benchmark by 1 "piece"; Benchmark other than a whole number*

Example of our modifications: Adding items to elicit a strategy that did not emerge from the children's task

Original item

7/10 or 8/9

Re-designed items

- 18/25 or 16/27
- 2/9 or 3/8
- 2/7 or 3/8
- 7/10 or 8/9

Take a few minutes to consider…

1. What do you see as the advantages and disadvantages of using or modifying children's tasks for use in IBL mathematics content courses for prospective teachers?
2. Do all children's tasks have the same potential? What might be some features of children's tasks that would be especially worthwhile? What resources are you familiar with to locate such tasks?
3. What are some generalizable design principles for modifying children's tasks for use in mathematics content courses for prospective teachers?

Thank you for coming!

- The task we shared today, a facilitation guide for this task, and resources for finding appropriate children's tasks are available on our website:

  www.mathtaskmasters.com

- If you use the task, we would love to hear how it went and any suggestions you have regarding revisions to the task and/or facilitation guide!