Using Reflective Analysis to Modify Mathematical Tasks after Enactment

Jennifer M. Tobias

Amy Hillen

Dana Olanoff (and Alexa ☺)

Rachael M. Welder

Eva Thanheiser

Ziv Feldman

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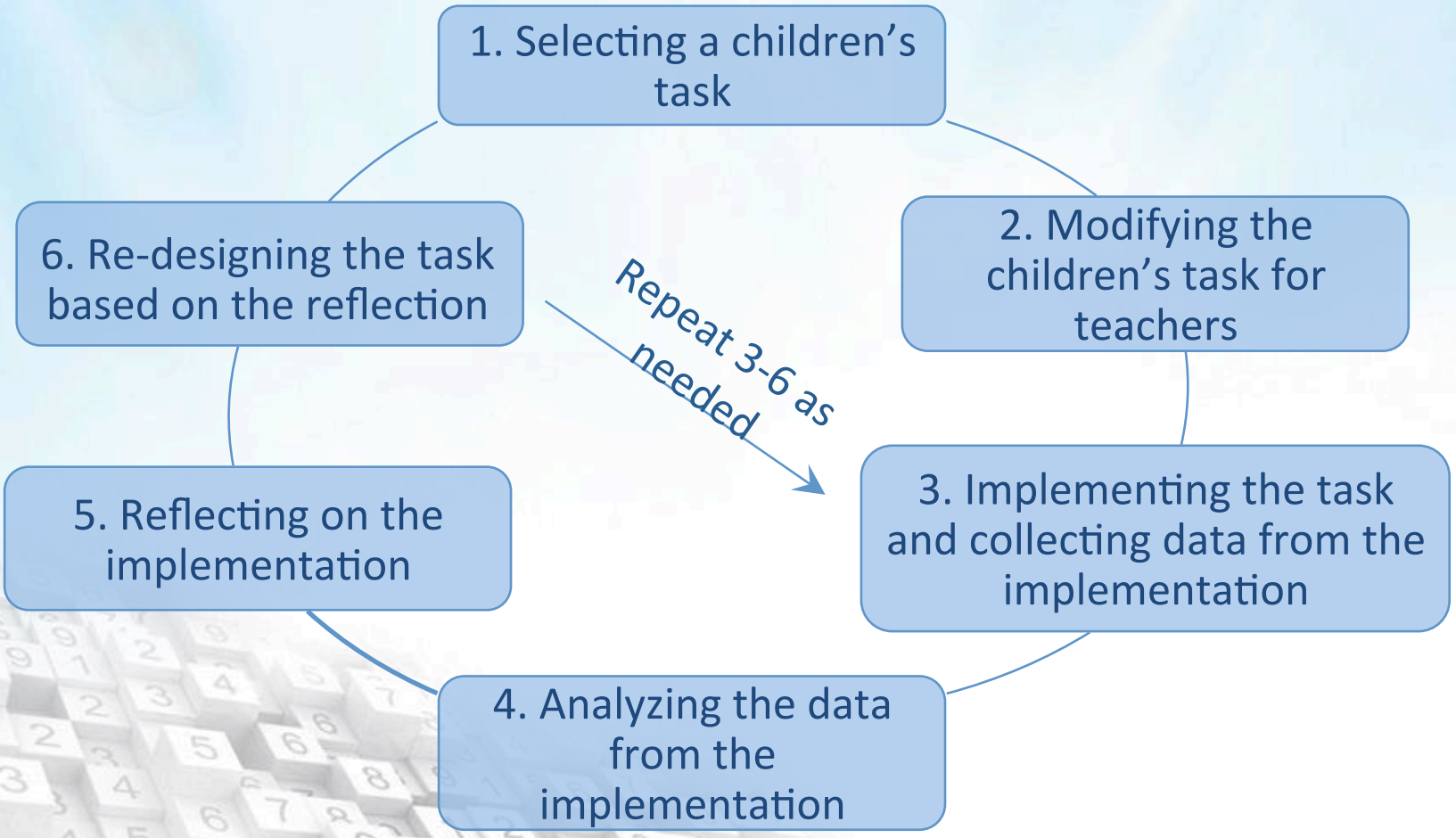
Session overview

- Provide a brief description of task design and reflective analysis
- Engage in aspects of reflective analysis
- Share results of our reflective analysis and subsequent modifications to a fraction comparison task
- Discuss implications of reflective analysis and how to apply in other settings

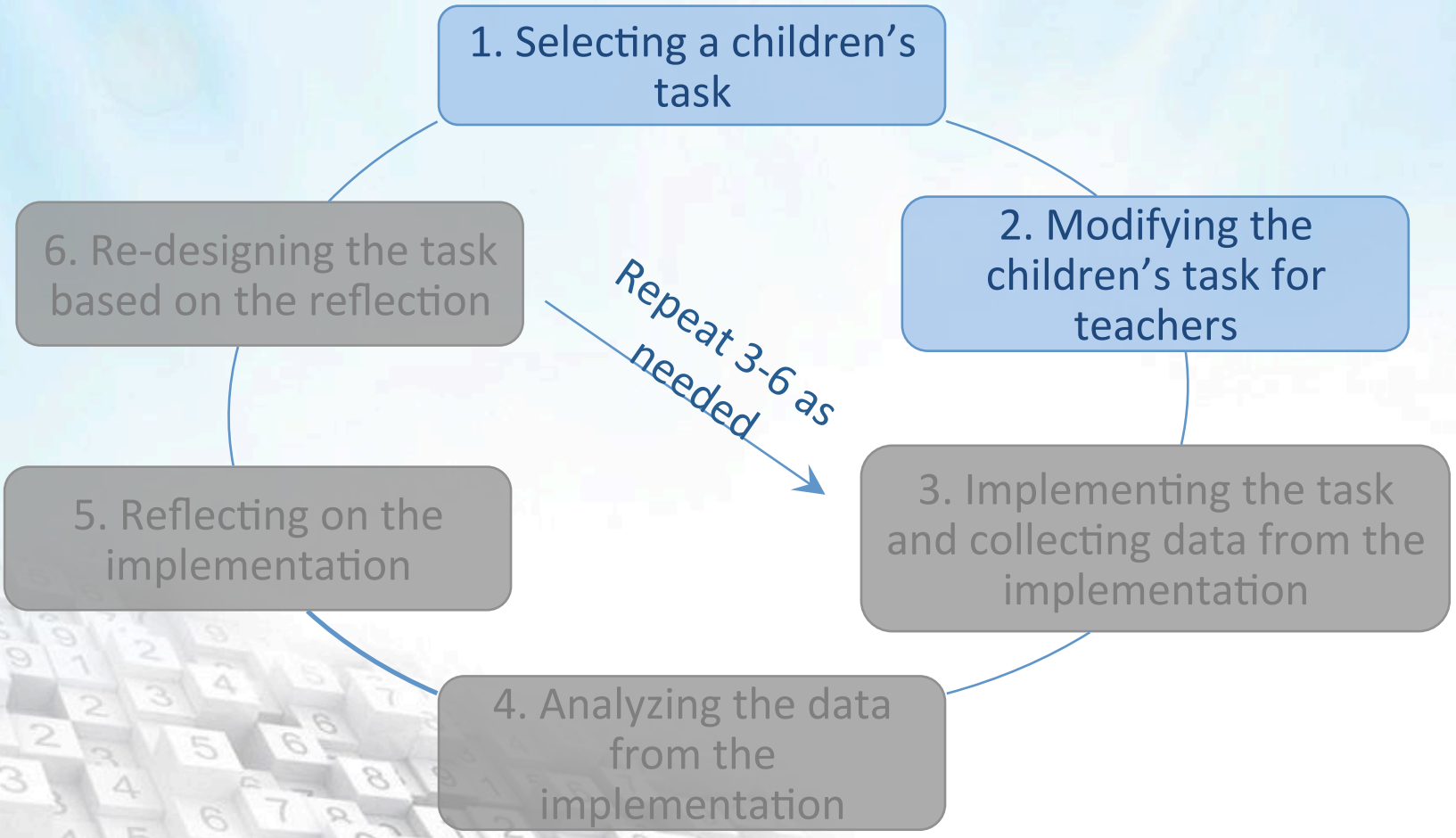
Task design

- Iterative cycles for task design consist of *predictive analysis, trial, reflective analysis,* and *adjustment* (Liljedahl, Chernoff, & Zazkis, 2007)

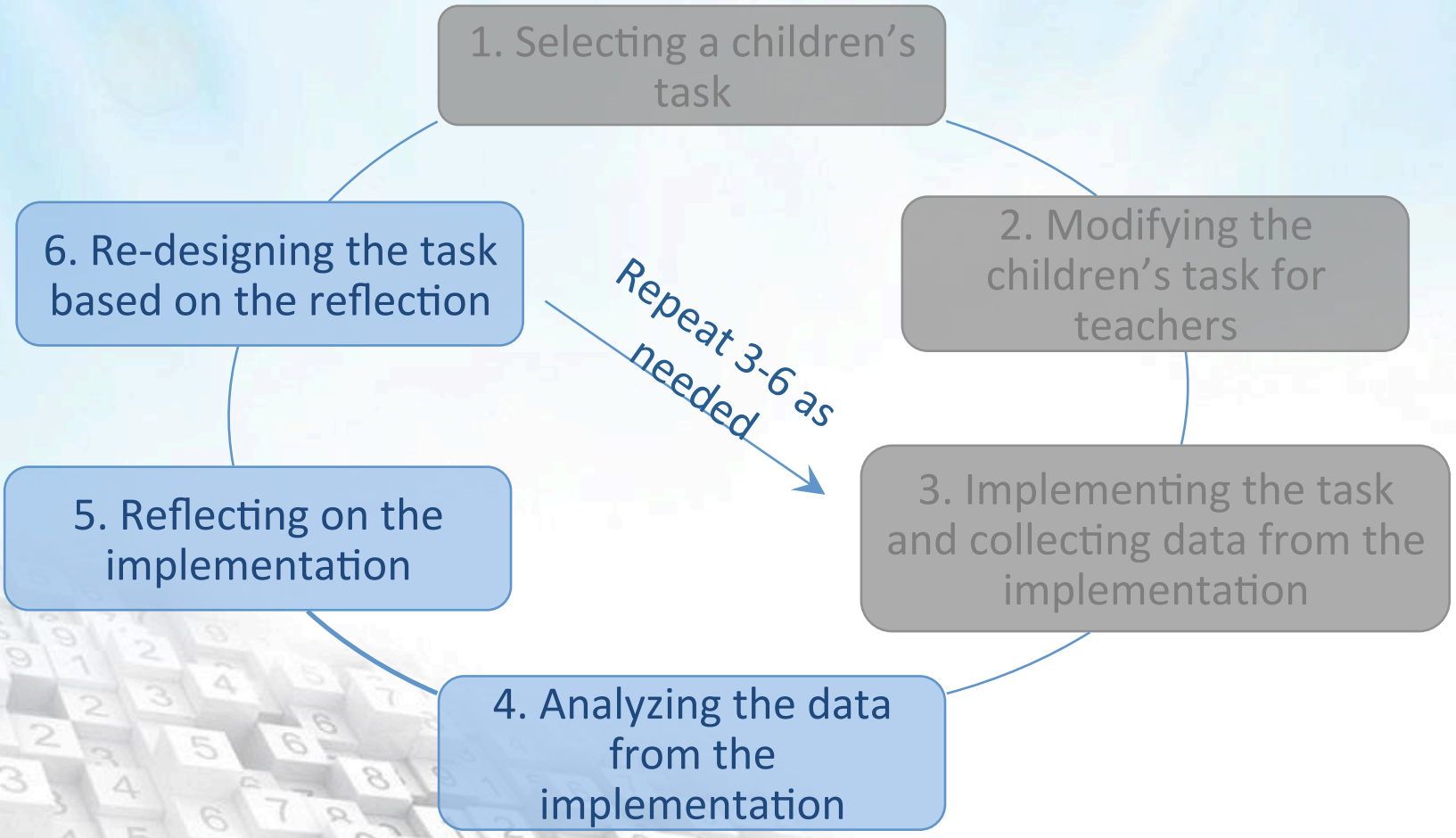
Task Design Cycle



Task Design Cycle



Task Design Cycle



Task Design Cycle

6. Re-designing the task based on the reflection

5. Reflecting on the implementation

4. Analyzing the data from the implementation

During reflective analysis, data is analyzed "for the mathematical and pedagogical affordances that the task, as designed and implemented, actually assesses"

(Liljedahl et al., 2007, p. 241)

Engaging in task design: An example

Mathematical goal:

Develop the following sense-making strategies for comparing and ordering fractions and use them where appropriate:

- Same sized pieces
- Same number of pieces
- Comparing to a benchmark
- Greater number of larger pieces

Setting the stage for reflective analysis

- What would you be looking for in preservice teachers' written work?

Engaging in aspects of reflective analysis

Consider the data shown in the handout packet…

- What do you notice?
- What does the data tell you? What questions does the data raise for you? What are you left wondering?
- What modifications would you want to make to the task? Why?

Task modifications

Problem	Fractions to Compare	Intended Strategy	Rationale for Revision or Addition
1	1/2 vs. 17/31	BVE [1/2], EF-SSP, or EF-SNP	n/a
2	2/17 vs. 2/19	SNP	n/a
3	4/7 vs. 9/14	EF-SSP	n/a
4	3/7 vs. 6/11	BVB [1/2] or EF-SNP	n/a
5	8/9 vs. 12/13	BVD [1]	n/a
6	13/15 vs. 17/19	BVD [1]	n/a
7	15/17 vs. 19/18	BVB [1]	Problem revised (from 5/6 vs. 6/5) to increase the level of cognitive demand and discourage pattern-matching

Task modifications

Problem	Fractions to Compare	Intended Strategy	Rationale for Revision or Addition
8	7/10 vs. 8/9	GLP	n/a
9	1/4 vs. 25/99	BE [1/4] or EF-SNP	n/a
10	24/7 vs. 34/15	BVB [3]	n/a
11	2/7 vs. 3/8	BVB [1/2] or EF-SNP	Problem added because it: • can be solved using a combination of strategies • can be solved using a benchmark value of 1/3 (in addition to 1) • provides an opportunity to compare and contrast situations where GLP can and cannot be used (i.e., #11 and #14 are comprised of similar fractions, yet GLP can only be used on #14)

Task modifications

Problem	Fractions to Compare	Intended Strategy	Rationale for Revision or Addition
12	25/12 vs. 31/15	BVD [2]	Problem added because it: • can be solved using a combination of strategies • targets a benchmark value greater than 1 • provides an opportunity to compare two fractions that are both greater than the targeted benchmark value
13	11/20 vs. 19/36	BVD [1/2]	Problem added because it: • can be solved using a combination of strategies • provides an opportunity to compare two fractions that are both greater than the targeted benchmark value

Task modifications

Problem	Fractions to Compare	Intended Strategy	Rationale for Revision or Addition
14	2/9 vs. 3/8	BVD [1/3], GLP	Problem added because it: • can be solved using a combination of strategies • targets a benchmark value of 1/3 • can be solved using GLP
15	18/25 vs. 16/27	GLP	Problem added because it: • may be more likely to elicit GLP given that no other strategy is especially

Some implications of reflective analysis

- What can *reflective analysis* reveal about task design/re-design in general?
- How can *reflective analysis* help mathematics teacher educators assess and address PTs' content knowledge?

Implications of reflective analysis

- Reflective analysis provided us with opportunities to identify
  - aspects of task implementation that did and did not unfold as intended
  - modifications that could better align the task with our intended learning goals
  - other issues that emerged that had not previously been considered but might allow for additional learning opportunities

Take a few minutes to consider…

- The affordances and limitations of reflective analysis
- How you might use reflective analysis in your practice
- How to make reflective analysis manageable given all the other demands on our time

Future Directions with Reflective Analysis

- Using reflective analysis to:
  - Go beyond if they got the right answer or used the intended strategy
  - Analyze PTs' argument quality
  - Analyzing PTs' thinking over time and on more than one task

Thank You For Coming

For the comparing fractions task and facilitation notes for this task, please see our website: www.mathtaskmasters.com

Task Masters

email: masters@mathtaskmasters.com

Comparing fractions

1. 1/2 vs. 17/31	2. 2/17 vs. 2/19
3. 4/7 vs. 9/14	4. 3/7 vs. 6/11
5. 8/9 vs. 12/13	6. 13/15 vs. 17/19
7. 5/6 vs. 6/5	8. 7/10 vs. 8/9
9. 1/4 vs. 25/99	10. 24/7 vs 34/15