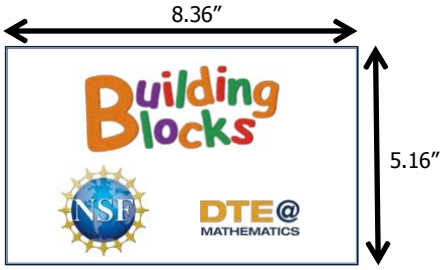
Session 6: Area Learning Trajectory – Instructional Activities



Overview of Session 6

- Your area assessments and anecdotal notes
  - Learning from Practice Protocol
- The third part of learning trajectories—Instructional Activities
  - Examples along the learning trajectory
  - Activities from your curriculum
- Review of the math of area measurement
- Classroom Connection Activity

Test ourselves!

Area Unit Relater and Repeater

Array Structurer

Physical Coverer and Counter

Initial Composite Structurer

Learning from practice protocol

- Why we are working on the note taking and using the Learning from Practice Protocol.
  - How it is important in teaching.
  - How teachers rarely get a chance to get better at it.

Using notes to describe student performance

Use the Learning from Practice Protocol to:

- Describe what a particular student did on the area assessment task
- Establish a pattern for sharing and responding to what is shared
- Focus on how notes can capture details about performance and later support interpretations that connect to the learning trajectory
- Reflect

Sharing in small groups

Share the area assessment task you used and your notes in grade-level small groups. Discuss:

- What level(s) of thinking were you able to assess?
- What questions do your experiences using these activities with students raise about the learning trajectories?
- How could the use of notes be improved to support descriptions of students' engagement in measurement and connections with the learning trajectory?

Have one person record for short share-out about the process with whole group

Learning from practice protocol – Debriefing

Debrief in whole group:

- Insights gained into the learning trajectory for area
- The process of talking with colleagues using notes to support the discussion
- Ideas for enhancing the taking and use of notes
- Ways to enhance the protocol for next time

Learning from practice protocol – Debriefing

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Learning trajectories

- Goal
- Developmental Progression
- Instruction

What level is this developing?

Two activities

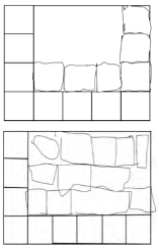
- Tile a region with a 2D unit of their choosing and discuss issues of leftover spaces, overlapping units and precision.
- Given three rectangles (e.g., 1×12; 2×6; 4×3), which covers the most space?

TRY IT!

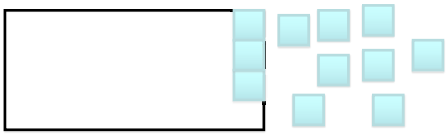
Physical Coverer and Counter

Attends to some aspects of the structure

- **Tiling.** Completely covers a region with physical tiles
- **Comparing.** Makes intuitive comparisons of 2D regions based on simple, direct comparisons (superimposition)
- **Drawing.** Approximate rectangular shapes, some gaps



Tiling with squares



Children cover a rectangle by tiling with physical square tiles and then learn the drawing convention to represent 2 contiguous edges with a single line. They discuss how to best represent a tiling that there must be no gaps or overlaps.

Complete Coverer and Counter

- **Drawing**. Draws a complete covering without gaps or overlaps and produces approximations of rows (errors of alignment and not all shapes equal size)
- **Producing.** Can build a region of specified area

Counting within an array

Children discuss, learn, and practice systematic counting strategies for enumerating arrays.

Area Unit Relater and Repeater (Part 1)

- **Quantifying.** Counts individual units, guided by rows
- **Drawing.** Draws a complete covering, one unit at at time, using an intuitive row or column structure and equal-size units.
- **Comparing.** Relates size and number of units.

Area Unit Relater and Repeater (Part 2)

- **Iterating.** Iterates individual tiles to measure
- **Producing.** Builds a region of area from an insufficient number of unit tiles through individual unit iteration

Activities developing later learning trajectory levels

Using a grid

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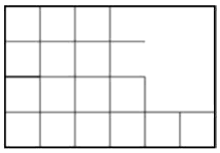
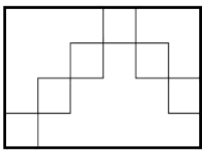
1. Children use squared paper to measure areas to reinforce the use of the unit square, as well as non-integer values.

What level is this developing?

Filling in a missing section



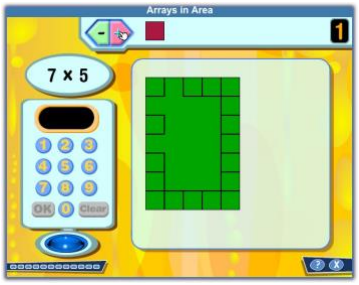


2. Fill in ever-greater numbers of missing sections. Use language such as "bringing down" a row.

Initial Composite Structurer A: Operating on groups of units

- Organizes counting, drawing, or moving of objects in composites units (unit of units)
- Finds reasonable estimates of regions (may use upper or lower bounds)

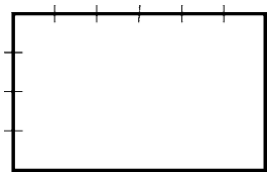
Computer array task



Initial Composite Structurer B: Coordinating and relating dimension

- Uses dimension displays as indicating the number of units in a row or column
- May identify dimensions of a region without correctly drawing the array of units

Mentally constructing area



Children are encouraged to "fill in" open regions by mentally constructing a row, setting up a 1–1 correspondence with the indicated positions, and then repeating that row to fill the rectangular region.

Area Row and Column Structurer

- Decomposes/recomposes partial units to make whole units
- Drawing/visualizing. Uses given or measured dimensions to place both row and column line segments and create units

Visualizing arrays

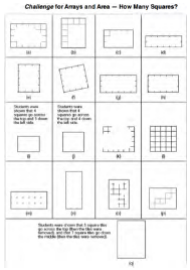
How much larger is one rectangle than another? How did you solve it?

TRY IT!

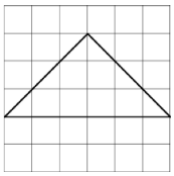
Array Structurer

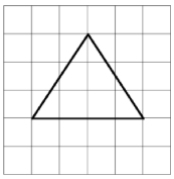
- With linear measures or other similar indications of the two dimensions, multiplicatively iterates squares in a row or column to determine the area
- Drawing not necessary

Array and area challenges



How many whole squares fit?





Conceptual Area Measurer

- Has an abstract and generalizable understanding of the rectangular area formula
- Restructures regions to find the areas of triangles, kites, trapezoids, and parallelograms
- Recognizes that formulas for areas of these shapes are related to the formula for the area of a rectangle
- Uses geometric properties of these shapes to support reasoning

Area curriculum activity

In grade-level small groups, share the curriculum activities you brought in.

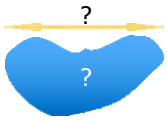
- What learning trajectory level(s) do they teach?
- Are they appropriate — based on insights from your assessments?
- How might you improve the activities?
- What is the activity doing (or not) to establish and maintain an environment that nurtures learning, mathematical practices and collective work on mathematics?
- What should the teacher be doing?

Area curriculum activity debriefing

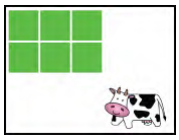
What did you learn from your interactions that you hadn't thought about before?

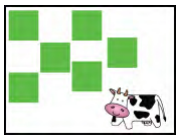
Measurement concepts – Area (Part 1)

Understanding the attribute of area



Conservation





Measurement concepts – Area (Part 2)

Transitivity

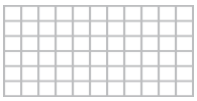
Equal partitioning

Measurement concepts – Area (Part 3)

Units and unit iteration

Accumulation of area and additivity

Relation between number and measurement



Summary

In this session you:

- Engaged in a workshop
  - Connecting students' performance on area measurement tasks with the learning trajectories
  - Considering ways to enhance the use of anecdotal notes
- Analyzed instructional activities in terms of the learning trajectories for area measurement