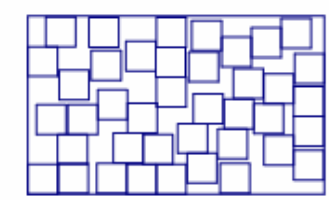
Research Summary

Measurement of Geometric Objects

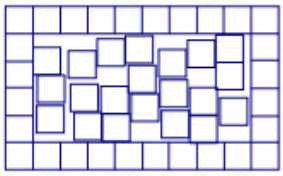
From: *Fostering Geometric Thinking* by Mark Driscoll et al.—Educational Development Center

Understanding Area: Battista (1999) asked students to predict the number of square tiles they would need to cover a given rectangle and then characterized different developmental levels for how these students were thinking about structuring two-dimensional space.

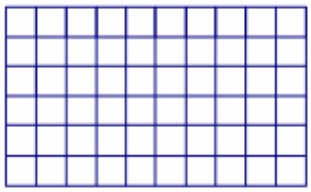
1. Students do not organize the space that they are structuring.



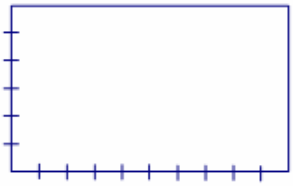
2. Students structure portions of the space, making groups of squares within the larger rectangle without being able to organize the entire space.



3. Students create an array of rows of squares in the rectangle but need to move the row physically to iterate it correctly.

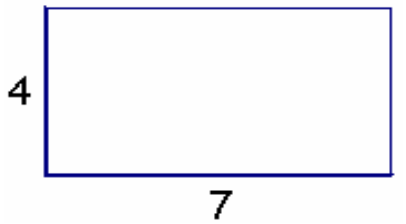


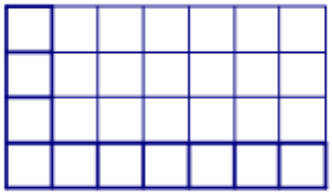
4. Students are able to abstract the rows and columns structure of the rectangle such that they can count the number of squares without drawing them or using the physical representations of them.



Understanding the Area Formula: Mitchelmore (1983) found that even if 6th and 7th graders could calculate areas of different rectangles when given side lengths, some could not draw unit squares in the figures to visually structure the space.

The measurement of a rectangle's area is usually treated (even if not at the outset, eventually) as the product of two lengths (i.e., adjacent sides). Students who do not understand that this multiplication of two numbers represents the structured space of the rectangle see the resulting "area" as just a product of two lengths (left figure), rather than as a representation of an array of units (right figure; Lehrer, 2003).





In efforts to support students in their emerging understanding of measurement, keep the following in mind:

- Asking your students to draw pictures showing what it means to multiply a rectangle's length and width may help uncover their understanding of the area formula.

References

Barrett, J.E., & Clements, D.H. (2003). Quantifying path length: Fourth-grade children's developing abstractions for linear measurement. *Cognition and Instruction*, 21, 475-520.

Battista, M.T. (1999). The Importance of Spatial Structuring. *Teaching Children Mathematics*, 6, 170-178.

Mitchelmore, M. (1983). Geometry and Spatial Learning: Some Lessons from a Jamaican Experience. *For the Learning of Mathematics*, 3(3), 2-7.

Lehrer, R. (2003). Developing Understanding of Measurement. In J. Kilpatrick, W.G. Martin, & D. Schifter (Eds.), *A Research Companion to Principles and Standards for School Mathematics*. (pp. 179-192). Reston, VA: National Council of Teachers of Mathematics.