DTE@ MATHEMATICS

Geometric Measurement and Spatial Reasoning in Elementary Mathematics Teaching
Session 2 Resource: Content Cube – Length Learning Trajectories

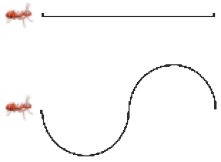
Pre-Length Quantity Recognizer (PLQR)

Does not identify length as attribute.

"This is long. Everything straight is long. If it's not straight, it can't be long."

Length Quantity Recognizer (LQR)

- Identifies length/distance as attribute.
- May understand length as an absolute descriptor (e.g., all adults are tall), but not as a comparative (e.g., one person is taller than another).



"Both paths are the same length."

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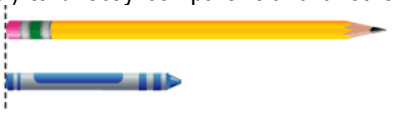
Length Comparer

A. Length Direct Comparer (LDC)

Physically aligns two objects to determine which is longer or if they are the same length.
May use a ruler (as a stick rather than a measuring tool) to directly compare it and another object.



B. Indirect Length Comparer (ILC)

Compares the length of two objects by representing them with a third object.

Uses a piece of string to compare the lengths of two objects.

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End-to-End Length Measurer (EE)

Lays units end to end. May not recognize the need for equal-length units. The ability to apply resulting measures to comparison situations develops later in this level.

Length Unit Relater and Repeater (LURR)

- Iterates a single unit to measure. Recognizes that different units will result in different measures and that identical units should be used, at least intuitively and/or in some situations.
- Uses rulers with minimal guidance

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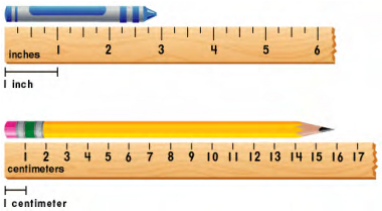
Consistent Length Measurer (CLM)

- Considers the length of a bent path as the sum of its parts (not the distance between the endpoints).
- Measures, knowing need for identical units, relationship between different units, partitions of unit, zero point on rulers, and accumulation of distance.
- Begins to estimate.



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Conceptual Ruler Measurer (CRM)

- Has an "internal" measurement tool.
- Mentally moves along an object, segmenting it and counting the segments.
- Operates arithmetically on measures. Projects or translates given lengths to determine missing lengths.
- Estimates the length of an object that is not partitioned with accuracy and without any available image of the standard unit.
- Employs explicit strategies to estimate lengths, including developing benchmarks for units and composite units and mentally iterating those units.

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Integrated Conceptual Path Measurer (ICPM)

- Computes length of complex bent path and perimeter of a polygon.
- Can change one part of a figure and adjust other sides to compensate for length changes.
- In selection of units, children show well-developed ideas of precision and accuracy.

Abstract Length Measurer (ALM)

- Organizes and synthesizes sets of objects based on perimeter or collections of complex bent paths.
- Constructs derived units with linear measures and make appropriate unit conversions, including units and divisions of units. Can explain that this subdivision process is *potentially unlimited*.
- Measures to the degree of precision allowed by a tool by estimating to a fraction of the smallest calibration mark provided on the instrument.

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