

**Emergent**

**During the Emergent phase:**  
...students come to understand and use the everyday language of attributes and comparisons and differentiate between attributes that are obviously perceptually different

**By the end of the Emergent phase, students:**

- describe two or three obvious measurement attributes of the same thing
- describe something as having more or less of an attribute than something else

*These students recognize that attributes can be compared.*

**Matching and Comparing**

Most students enter this phase between 5 and 7 years of age

**As students enter the Matching & Comparing phase:**

- may not "conserve" measures, thinking that moving a rod changes its length;
- may visually compare the size of two things, but make no effort to match
- may identify two attributes but not understand that the two attributes lead to different orders of size

**During the Matching and Comparing phase:**  
...students match in a conscious way to decide which is bigger. They also repeat copies of objects to decide how many fit, balance or match an object or event.

**By the end of the Matching and Comparing phase, students:**

- line up the base of two sticks when comparing their lengths...
- ... count how many repeats of an object fit or match another
- count objects and call it "measuring"

*These students use matching and direct comparison to "measure".*

**Quantifying**

Most students enter this phase between 7 and 9 years of age

**As students enter the Quantifying phase:**

- may count "units" but be fairly casual in their repetition of units, not noticing gaps or overlaps
- do not necessarily expect the same "answer" each time when deciding how many fit
- may not see the significance of using a common unit to compare two things

**During the Quantifying phase:**  
...students connect the ideas of directly comparing the size of things and of deciding how many fit.

**By the end of the Quantifying phase, students:**

- attempt to ensure uniformity of representations of the unit
- ...make as close a match as possible, avoiding gaps and overlaps
- know why they need to use the same size objects to use as units when comparing two objects

*These students trust the count of units as an indicator of size and use this to make comparisons*

**Measuring**

Most students enter this phase between 9 and 11 years of age

**As students enter the Measuring phase:**

- may find that the desire to make as close a match as possible overrides their need to use a consistent unit
- may still think of the unit as an object... and so have difficulty with the idea of combining part-units in order to find the area of a region
- may confuse the unit (a quantity) with the instrument (or object) used to represent it

**During the Measuring phase:**  
...students come to understand the unit as an amount and see that part-units can be combined to form whole units

**By the end of the Measuring phase, students:**

- expect the same number of units to match the object being measured regardless of how they are arranged
- compose "part-units" into wholes
- can themselves partition a rectangle into appropriate squares and use the array structure to work out the number of squares

*These students trust the measurement as an unchanging property of the object*

**Relating**

Most students enter this phase between 11 and 13 years of age

**As students enter the Relating phase:**

- while using the array structure to find the area of a rectangle, may not connect this with multiplying the side lengths to find the area
- While able to understand the relationship between part units and the whole unit, may still be reluctant to subdivide a unit or use decimals to express a measurement when greater accuracy is needed
- while converting between known standard units, may not see the significance of the decimal structure built into all metric measures

**During the Relating phase:**  
...students work with measurement information itself and come to understand relationships between attributes and between units

**By the end of the Relating phase, students:**

- understand that known relationships between attributes can be used to find measurements that cannot be found directly
- think of part-units themselves as units
- subdivide units to make measurements more accurate

*These students use measurements to indirectly measure things*

in the MATCHING and COMPARING Phase

in the QUANTIFYING Phase

in the MEASURING Phase

in the RELATING Phase

At the end of the RELATING Phase



First Steps in Mathematics

# Overview of Diagnostic Map: Measurement