Content Maps and Measures of Alignment
for
Elementary School Mathematics

The charts on the following pages present 'pictures' or descriptions of instructional and assessment content for grade 8 mathematics. The descriptions are presented in the form of 'topographic' maps, which provide a powerful graphic portrayal of data arrayed in a three dimensional space. The data upon which these content 'maps' are constructed are based in a three-dimensional construct for describing instructional content. One of these three dimensions is simply 'amount of time' spent in one topic domain relative to another. This dimension is reported as "percent of instructional time" or "percent of assessment score" depending upon whether it is describing instructional practice or the content contained in an assessment. The other two dimensions for describing content are 1) topics and 2) cognitive demand.

The taxonomy presumes that any given element of instructional content can be described in terms of the intersection of these two dimensions. For example, a test item or a lesson plan may be largely focused on the topic area of measurement. However, this information alone tells one only so much about the item or lesson itself. Is the lesson primarily concerned with providing students an opportunity to learn the terms associated with various measurement systems? Or does the lesson (or test item) require students to formulate some hypothesis, conduct a laboratory investigation, or make some calculation based upon measurement? The cognitive demand dimension offers six categories into which any of the eighty-four topics listed for middle school mathematics can be further distinguished. Thus elementary science is described using a two dimensional matrix consisting of eighty-four rows (topics) by six columns (cognitive demand), yielding a total matrix consisting of 504 unique topic by cognitive demand cells. Into each cell is entered a number representing the proportion of overall emphasis of instruction or an assessment that cell contributes to the overall content being described. It is this data set from which the content maps are constructed.
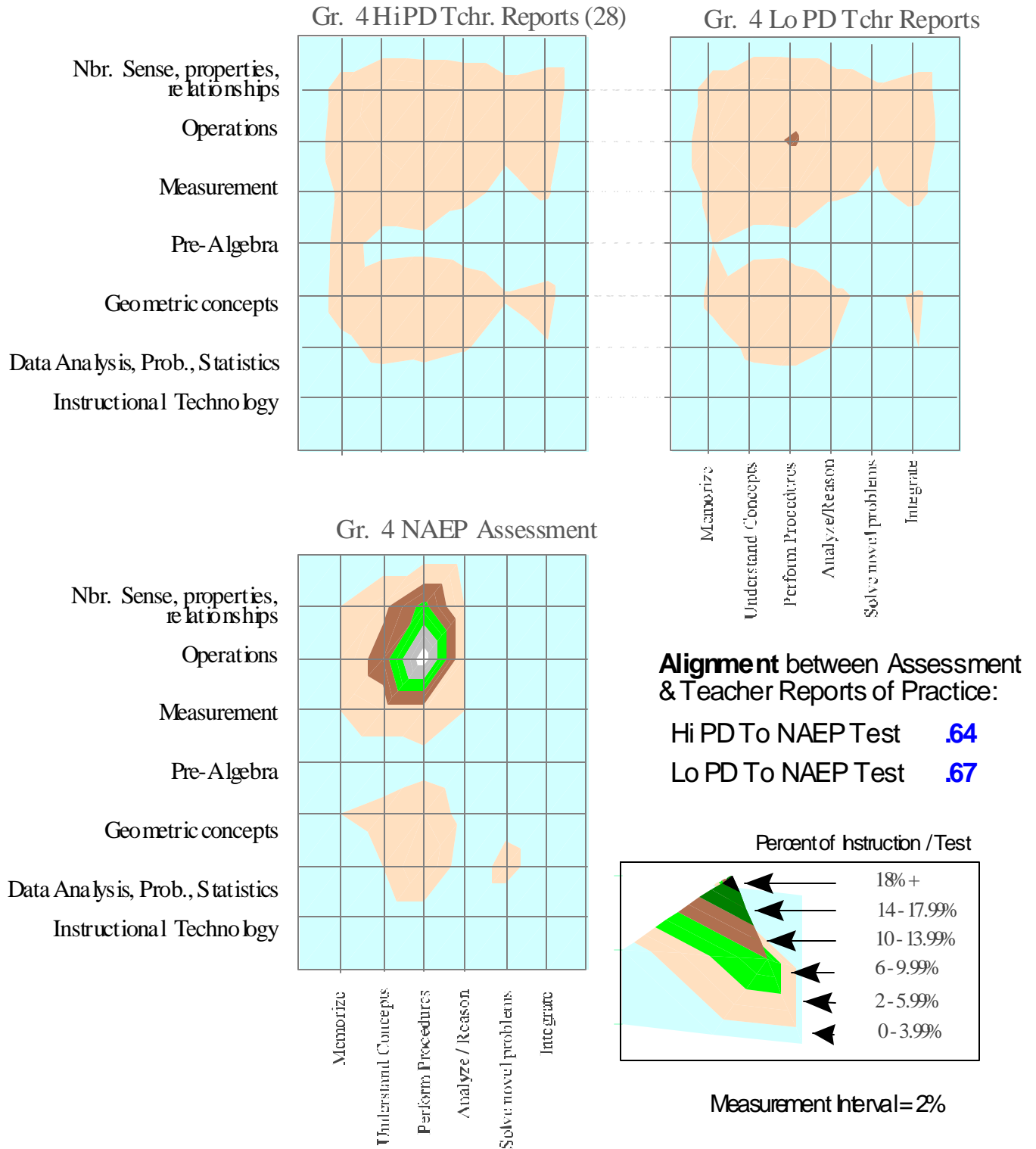
Topics are organized into two levels of grain size for middle school mathematics. The 504 cells described above represent the finest grain level of description, and is the level at which the data is collected. For ease of reporting, this fine grain data can be aggregated up to large grain 'chunks'. The eighty-four unique topics are grouped into six 'topic areas', with each topic area made up of from three to twenty-one topics. The topic areas are 1) Number sense, properties, and relationships, 2) Measurement, 3) Data analysis, probability, statistics, 4) Algebraic concepts, 5) Geometric concepts, and 6) Instructional technology.

The maps are linked so that the reader may jump between grain sizes. Move to finer grain descriptions by clicking the relevant topic area label or section of the map. Use the arrow in the bottom left corner to move up a level of grain size.

Alignment measures calculate the extent of agreement between two content embedded descriptions (generally instruction to assessment, though alignment can be measured between two assessment instruments or between two descriptions of practice). On the following pages, alignment measures are reported for NAEP to instruction and state assessment to instruction. The numbers reported for a given page are based on the data for that page. That is to say, in interpreting an alignment measure one would read the information as: For that portion of content focused on 'X' (given in title of chart), there is a .nn level of agreement between the instruction and assessment being reported. Alignment measures range from 0 to 1, with zero representing no alignment, and 1 representing perfect alignment.

Grade 4 Mathematics
Large Grain
Content Maps
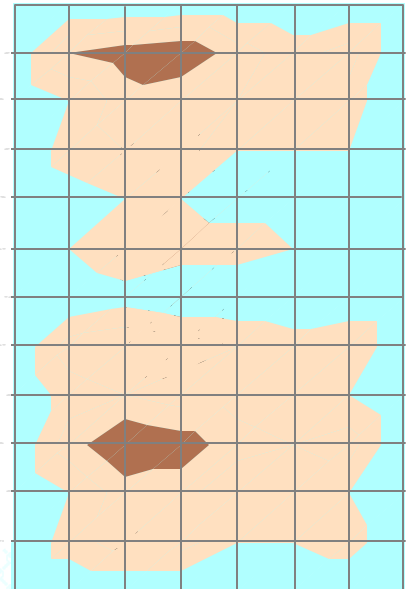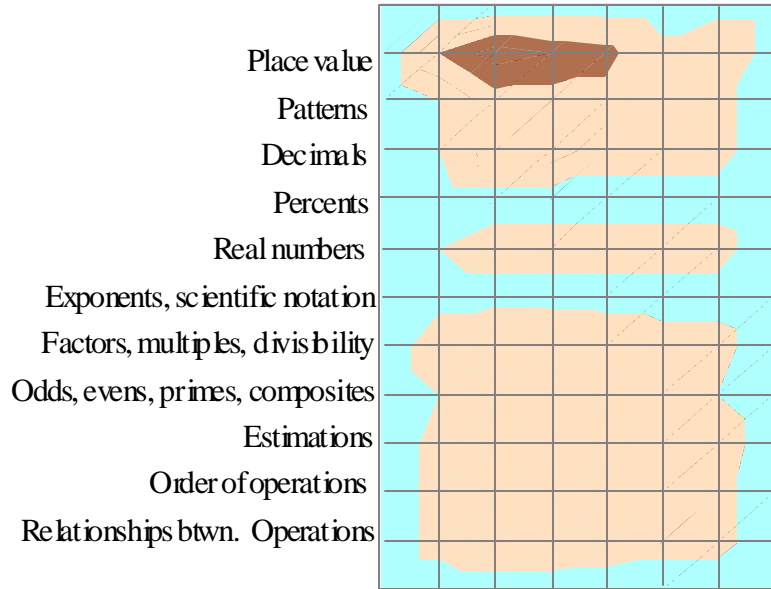
Click on topic area label or map area to see finer grain size.

Gr. 4 HiPD Tchr. Reports (28)

Gr. 4 Lo PD Tchr Reports

Nbr. Sense, properties, relationships
Operations
Measurement
Pre-Algebra
Geometric concepts
Data Analysis, Prob., Statistics
Instructional Technology

Memorize
Understand Concepts
Perform Procedures
Analyze/Reason
Solve novel problems
Integrate

Gr. 4 NAEP Assessment

Nbr. Sense, properties, relationships
Operations
Measurement
Pre-Algebra
Geometric concepts
Data Analysis, Prob., Statistics
Instructional Technology

Memorize
Understand Concepts
Perform Procedures
Analyze / Reason
Solve novel problems
Integrate

Alignment between Assessment & Teacher Reports of Practice:

Hi PD To NAEP Test   **.64**

Lo PD To NAEP Test   **.67**

Percent of Instruction / Test

18% +
14 - 17.99%
10 - 13.99%
6 - 9.99%
2 - 5.99%
0 - 3.99%

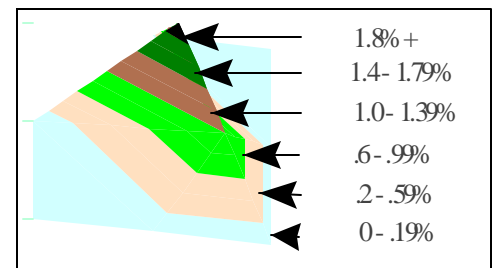Measurement Interval = 2%

Grade 4 Mathematics
Number sense, properties, relationships
Fine Grain Content Maps

Gr. 4 HiPD Tchr. Reports (28)

	Memorize	Understand Concepts	Perform Procedures	Analyze Reason	Solve novel problems	Integrate
Place value						
Patterns						
Decimals						
Percents						
Real numbers						
Exponents, scientific notation						
Factors, multiples, divisibility						
Odds, evens, primes, composites						
Estimations						
Order of operations						
Relationships btwn. Operations						

Gr. 4 Lo PD Tchr Reports

	Memorize	Understand Concepts	Perform Procedures	Analyze Reason	Solve novel problems	Integrate
Place value						
Patterns						
Decimals						
Percents						
Real numbers						
Exponents, scientific notation						
Factors, multiples, divisibility						
Odds, evens, primes, composites						
Estimations						
Order of operations						
Relationships btwn. Operations						

Gr. 4 NAEP Assessment

	Memorize	Understand Concepts	Perform Procedures	Analyze / Reason	Solve novel problems	Integrate
Place value						
Patterns						
Decimals						
Percents						
Real numbers						
Exponents, scientific notation						
Factors, multiples, divisibility						
Odds, evens, primes, composites						
Estimations						
Order of operations						
Relationships btwn. Operations						

Click here

To increase grain size

Alignment between Assessment
& Teacher Reports of Practice:

Hi PD To NAEP Test   **.44**

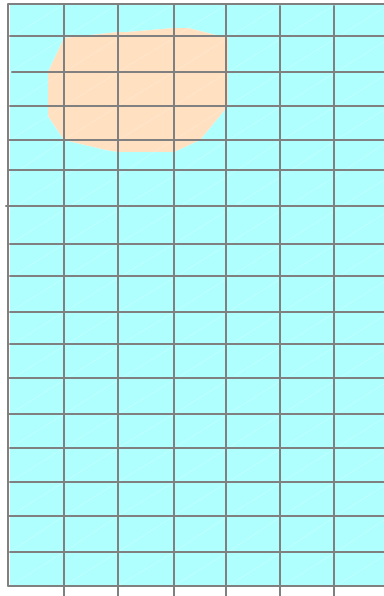Lo PD To NAEP Test   **.50**

Percent of Instruction / Test

	1.8% +
	1.4 - 1.79%
	1.0 - 1.39%
	.6 - .99%
	.2 - .59%
	0 - .19%

Measurement Interval = 0.2%

Grade 4 Mathematics
Operations
Fine Grain Content Maps

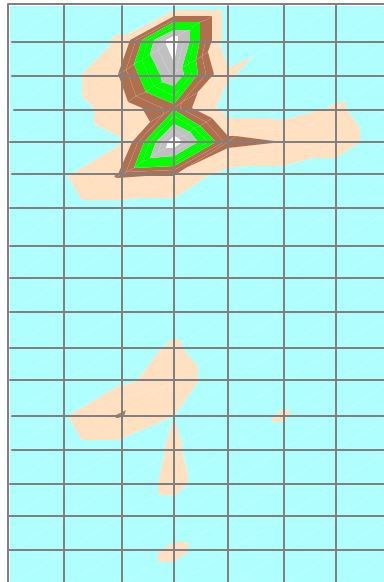### Gr. 4 HiPD Tchr. Reports (28)

Gr. 4 Lo PD Tchr Reports

	Add, subtract whole numbers
	Multiplication whole numbers
	Divisions whole numbers
	Comb. of add, subtract, multiply, divide by whole numbers
	Equivalent factors
	Add, subtract fractions
	Multiply fractions
	Divide fractions
	Comb. of add, subtract, multiply, divide fractions
	Ratio, proportion
	Representations of fractions
	Decimal equivalent to fraction
	Add, subtract decimals
	Multiply decimals
	Divide decimals
	Comb. of add, subtract, multiply, divide decimals

Memorize
Understand Concepts
Perform Procedures
Analyze/Reason
Solve novel problems
Integrate
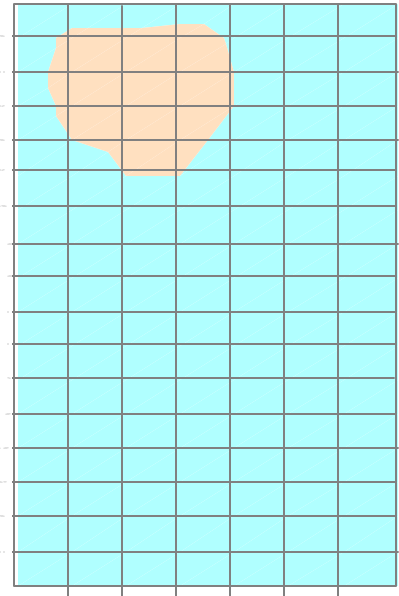
Gr. 4 NAEP Assessment

Add, subtract whole numbers
Multiplication whole numbers
Divisions whole numbers
Comb. of add, subtract, multiply, divide by whole numbers
Equivalent factors
Add, subtract fractions
Multiply fractions
Divide fractions
Comb. of add, subtract, multiply, divide fractions
Ratio, proportion
Representations of fractions
Decimal equivalent to fraction
Add, subtract decimals
Multiply decimals
Divide decimals
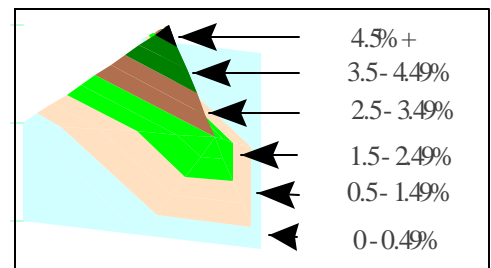Comb. of add, subtract, multiply, divide decimals

Memorize
Understand Concepts
Perform Procedures
Analyze / Reason
Solve novel problems
Integrate

Click here

To increase grain size

Alignment between Assessment & Teacher Reports of Practice:

Hi PD To NAEP Test   **.11**

Lo PD To NAEP Test   **.13**

Percent of Instruction / Test
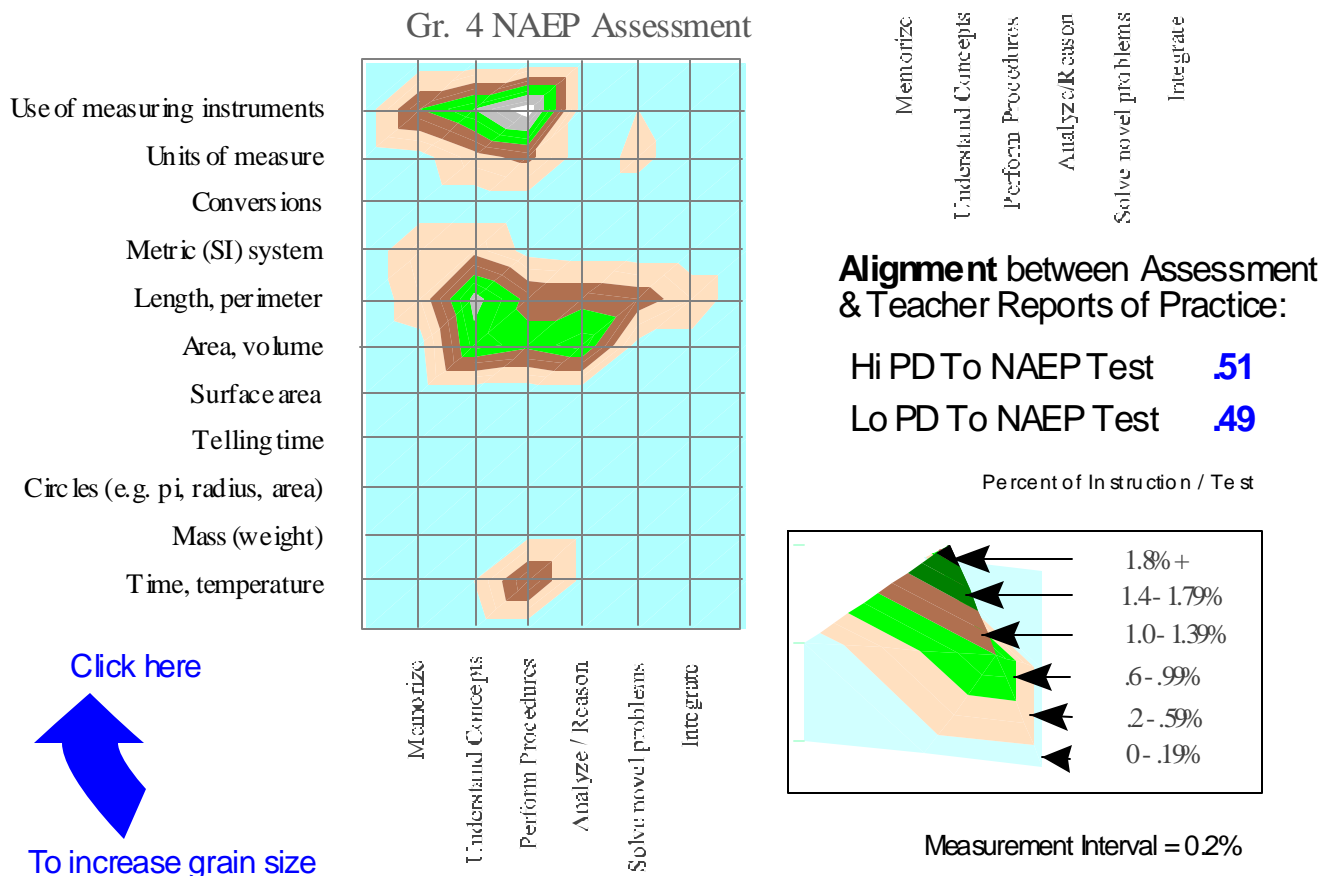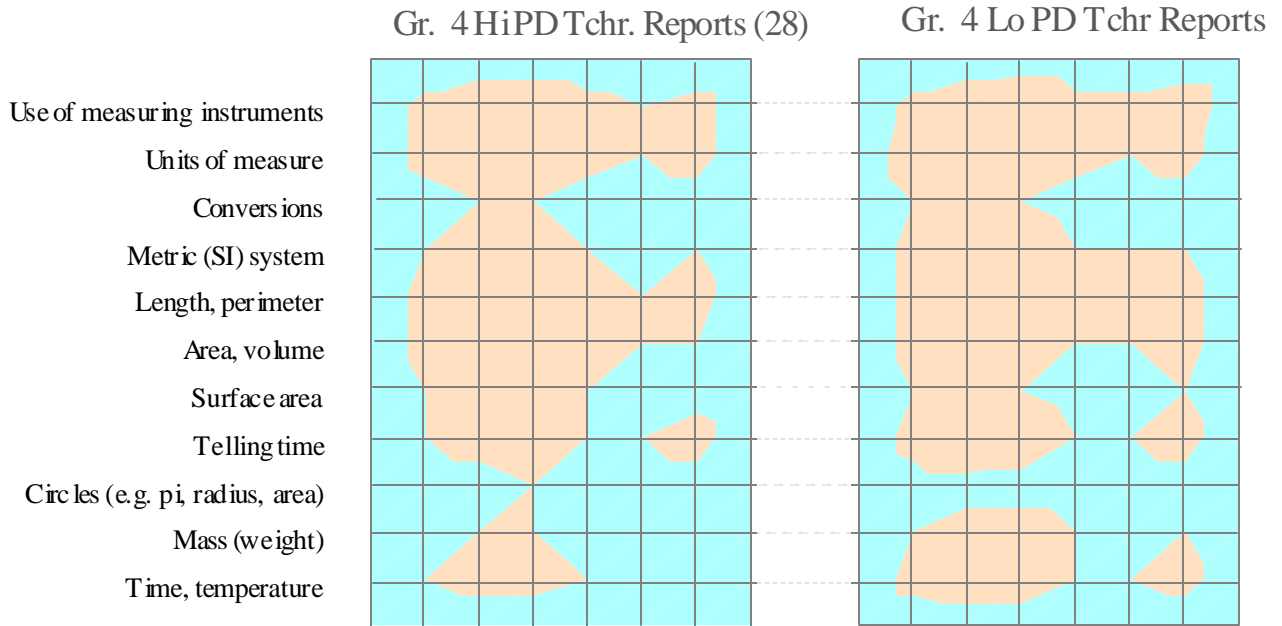
4.5% +
3.5 - 4.49%
2.5 - 3.49%
1.5 - 2.49%
0.5 - 1.49%
0 - 0.49%

Measurement Interval = 0.5%
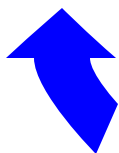
Grade 4 Mathematics
Measurement
Fine Grain Content Maps

Gr. 4 HiPD Tchr. Reports (28)

	Memorize	Understand Concepts	Perform Procedures	Analyze/Reason	Solve novel problems	Integrate
Use of measuring instruments						
Units of measure						
Conversions						
Metric (SI) system						
Length, perimeter						
Area, volume						
Surface area						
Telling time						
Circles (e.g. pi, radius, area)						
Mass (weight)						
Time, temperature						

Gr. 4 Lo PD Tchr Reports

Gr. 4 NAEP Assessment

	Memorize	Understand Concepts	Perform Procedures	Analyze / Reason	Solve novel problems	Integrate
Use of measuring instruments						
Units of measure						
Conversions						
Metric (SI) system						
Length, perimeter						
Area, volume						
Surface area						
Telling time						
Circles (e.g. pi, radius, area)						
Mass (weight)						
Time, temperature						

Click here

To increase grain size

Alignment between Assessment & Teacher Reports of Practice:

Hi PD To NAEP Test   **.51**

Lo PD To NAEP Test   **.49**

Percent of Instruction / Test

1.8% +
1.4 - 1.79%
1.0 - 1.39%
.6 - .99%
.2 - .59%
0 - .19%

Measurement Interval = 0.2%

Grade 4 Mathematics
Pre-Algebra
Fine Grain Content Maps
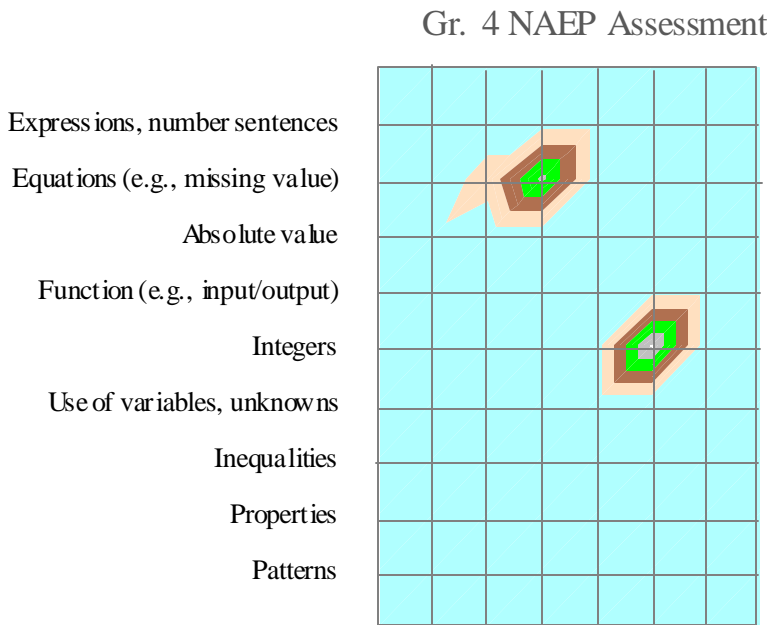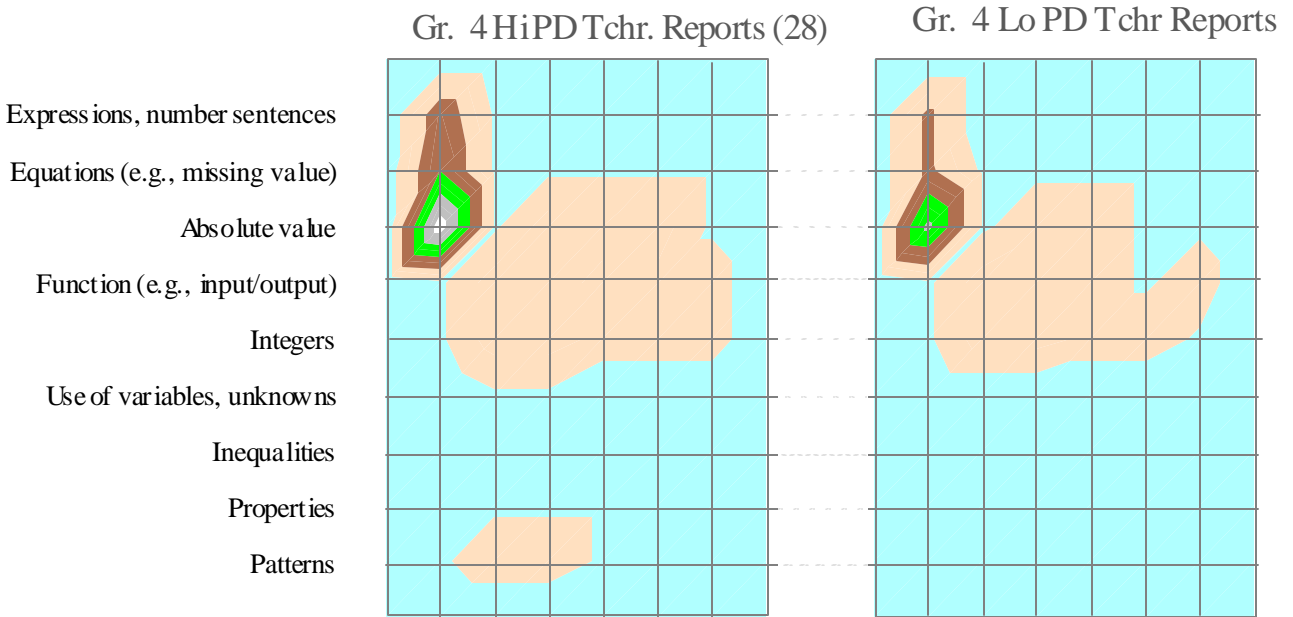
Gr. 4 HiPD Tchr. Reports (28)

Expressions, number sentences
Equations (e.g., missing value)
Absolute value
Function (e.g., input/output)
Integers
Use of variables, unknowns
Inequalities
Properties
Patterns

Gr. 4 Lo PD Tchr Reports

Memorize
Understand Concepts
Perform Procedures
Analyze/Reason
Solve novel problems
Integrate

Gr. 4 NAEP Assessment

Expressions, number sentences
Equations (e.g., missing value)
Absolute value
Function (e.g., input/output)
Integers
Use of variables, unknowns
Inequalities
Properties
Patterns

Memorize
Understand Concepts
Perform Procedures
Analyze / Reason
Solve novel problems
Integrate

Alignment between Assessment & Teacher Reports of Practice:

Hi PD To NAEP Test   **.15**

Lo PD To NAEP Test   **.16**

Percent of Instruction / Test

.9%+
.7 - .89%
.5 - .69%
.3 - .49%
.1 - .29%
0 - .09%
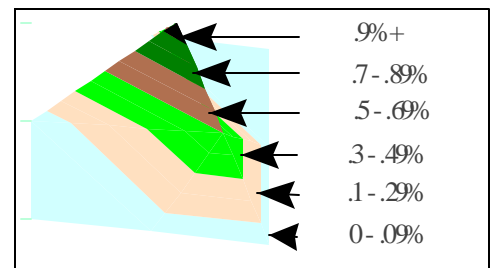
Click here

To increase grain size

Measurement Interval = 0.1%
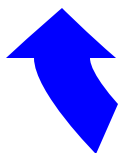
Grade 4 Mathematics
Geometric Concept
Fine Grain Content Maps

Gr. 4 HiPD Tchr. Reports (28)

Basic terminology
Points, lines, rays, and vectors
Patterns
Congruence
Similarity
Triangles
Quadrilaterals
Circles
Angles
Polygons
Polyhedra
Models
Spatial reasoning, 3-D relationships
Symmetry
Transformations (e.g., flips, turns)

Gr. 4 Lo PD Tchr Reports

Memorize
Understand Concepts
Perform Procedures
Analyze/Reason
Solve novel problems
Integrate
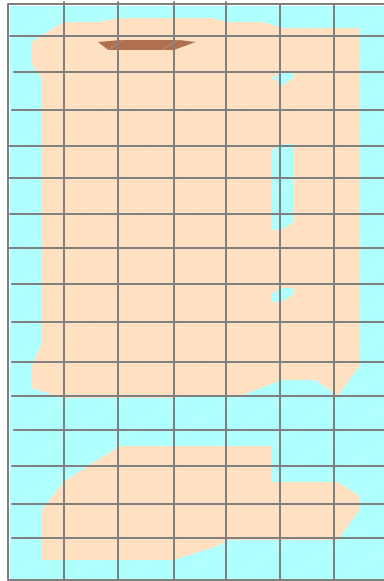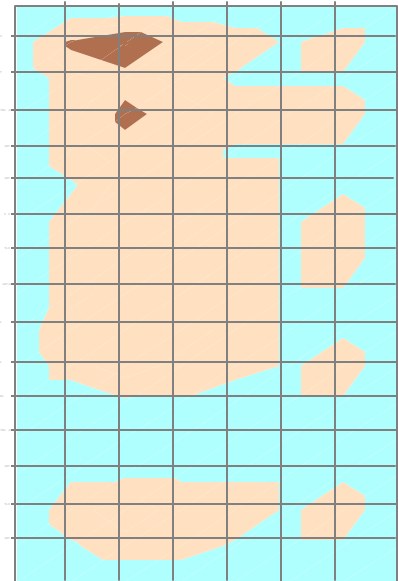
Gr. 4 NAEP Assessment

Basic terminology
Points, lines, rays, and vectors
Patterns
Congruence
Similarity
Triangles
Quadrilaterals
Circles
Angles
Polygons
Polyhedra
Models
Spatial reasoning, 3-D relationships
Symmetry
Transformations (e.g., flips, turns)

Memorize
Understand Concepts
Perform Procedures
Analyze / Reason
Solve novel problems
Integrate

Click here

To increase grain size
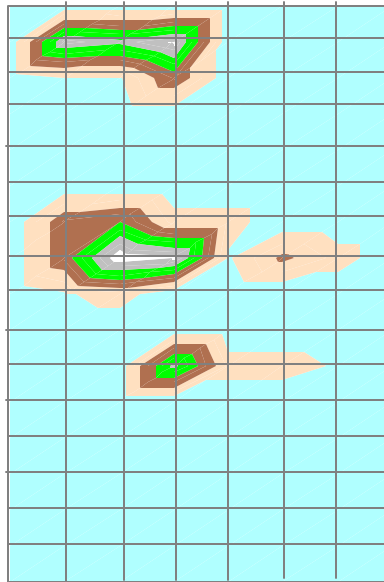
Alignment between Assessment & Teacher Reports of Practice:

Hi PD To NAEP Test   **.31**

Lo PD To NAEP Test   **.32**

Percent of Instruction / Test

.9%+
.7 - .89%
.5 - .69%
.3 - .49%
.1 - .29%
0 - .09%
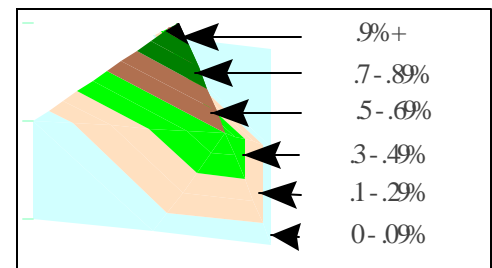
Measurement Interval = 0.1%
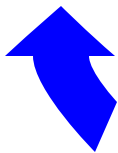
Grade 4 Mathematics
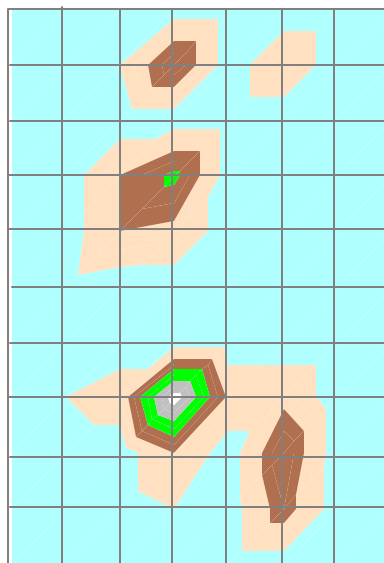## Data Analysis, Probability, Statistics
Fine Grain Content Maps

Gr. 4 HiPD Tchr. Reports (28)

Bar graph, histogram
Pie charts, circle graphs
Pictographs
Line graphs
Mean, median, mode
Quartiles, percentiles
Simple probability
Combinations and permutations
Summarize data in a table or graph

Gr. 4 Lo PD Tchr Reports

Memorize
Understand Concepts
Perform Procedures
Analyze/Reason
Solve novel problems
Integrate
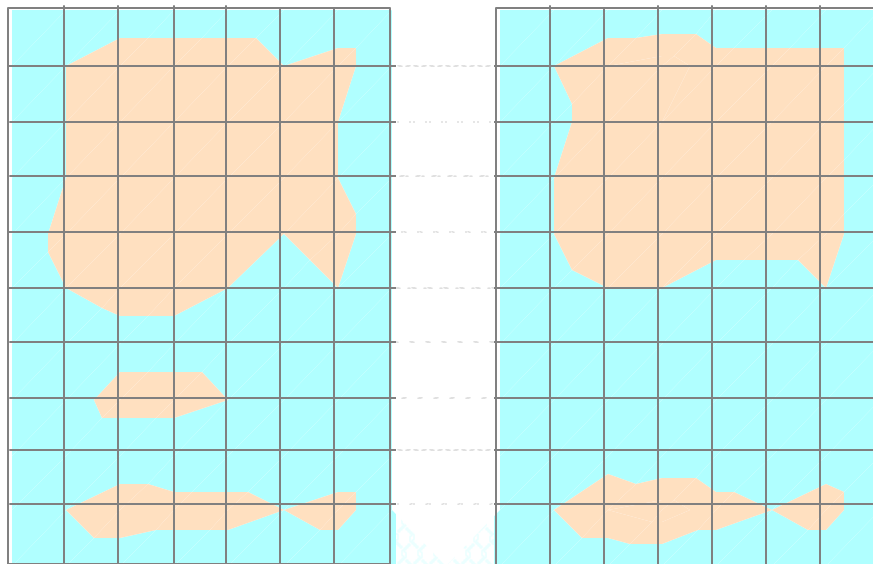
Gr. 4 NAEP Assessment

Bar graph, histogram
Pie charts, circle graphs
Pictographs
Line graphs
Mean, median, mode
Quartiles, percentiles
Simple probability
Combinations and permutations
Summarize data in a table or graph

Memorize
Understand Concepts
Perform Procedures
Analyze / Reason
Solve novel problems
Integrate

Click here

To increase grain size

Alignment between Assessment & Teacher Reports of Practice:

Hi PD To NAEP Test   **.33**

Lo PD To NAEP Test   **.34**

Percent of Instruction / Test

	1.8%+
	1.4- 1.79%
	1.0- 1.39%
	.6 - .99%
	.2 - .59%
	0 - .19%
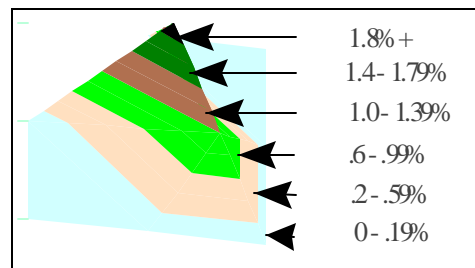
Measurement Interval = 0.2%
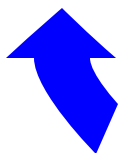
Grade 4 Mathematics
Instructional Technology
Fine Grain Content Maps

Gr. 4 Hi PD Tchr. Reports (28)

Use of calculators

Computers and Internet

Memorize

Understand Concepts

Perform Procedures

Analyze/Reason

Solve novel problems

Integrate

Gr. 4 Lo PD Tchr Reports

Memorize

Understand Concepts

Perform Procedures

Analyze/Reason

Solve novel problems

Integrate
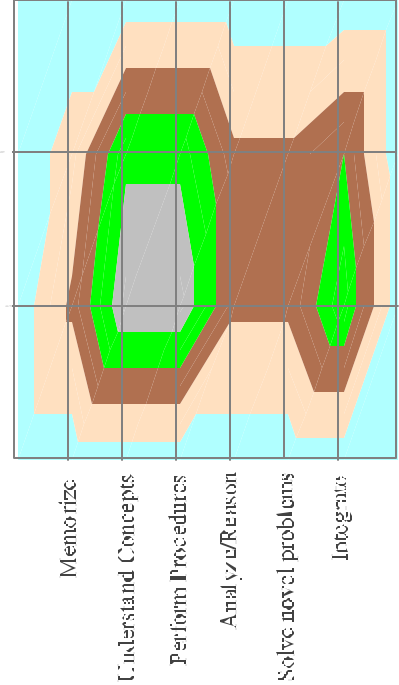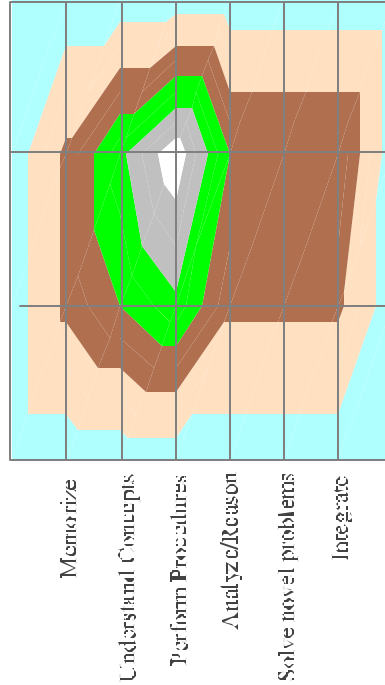
Gr. 4 NAEP Assessment

Use of calculators

Computers and Internet

Memorize

Understand Concepts

Perform Procedures

Analyze / Reason

Solve novel problems
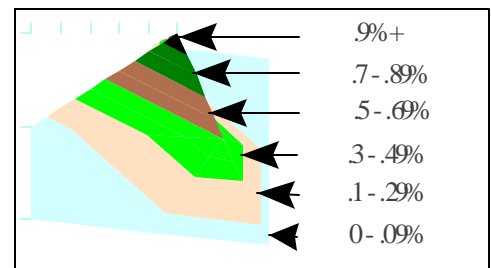
Integrate

Click here

To increase grain size
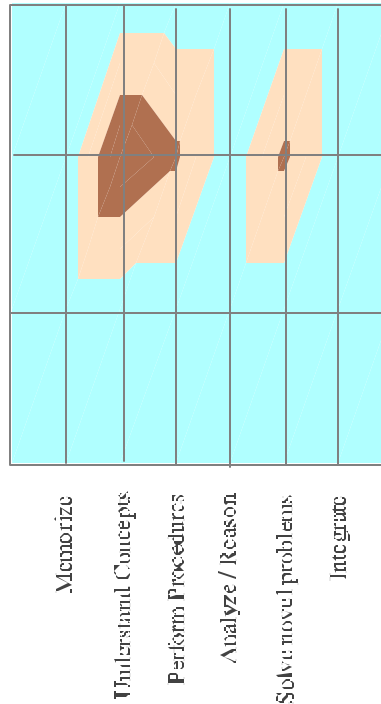
Alignment between Assessment
& Teacher Reports of Practice:
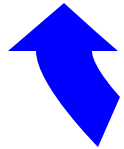
Hi PD To NAEP Test   **.36**

Lo PD To NAEP Test   **.28**

Percent of Instruction / Test

.9%+

.7 - .89%

.5 - .69%

.3 - .49%

.1 - .29%

0 - .09%

Measurement Interval = 0.1%