National Center and State Collaborative

Core Content Connectors: Measurement 1

National Center and State Collaborative

The National Center and State Collaborative (NCSC) is applying the lessons learned from the past decade of research on alternate assessments based on alternate achievement standards (AA-AAS) to develop a multi-state comprehensive assessment system for students with significant cognitive disabilities. The project draws on a strong research base to develop an AA-AAS that is built from the ground up on powerful validity arguments linked to clear learning outcomes and defensible assessment results, to complement the work of the Race to the Top Common State Assessment Program (RTTA) consortia.

Our long-term goal is to ensure that students with significant cognitive disabilities achieve increasingly higher academic outcomes and leave high school ready for post-secondary options. A well-designed summative assessment alone is insufficient to achieve that goal. Thus, NCSC is developing a full system intended to support educators, which includes formative assessment tools and strategies, professional development on appropriate interim uses of data for progress monitoring, and management systems to ease the burdens of administration and documentation. All partners share a commitment to the research-to-practice focus of the project and the development of a comprehensive model of curriculum, instruction, assessment, and supportive professional development. These supports will improve the alignment of the entire system and strengthen the validity of inferences of the system of assessments.

IDEAs that Work
U.S. Office of Special Education Programs

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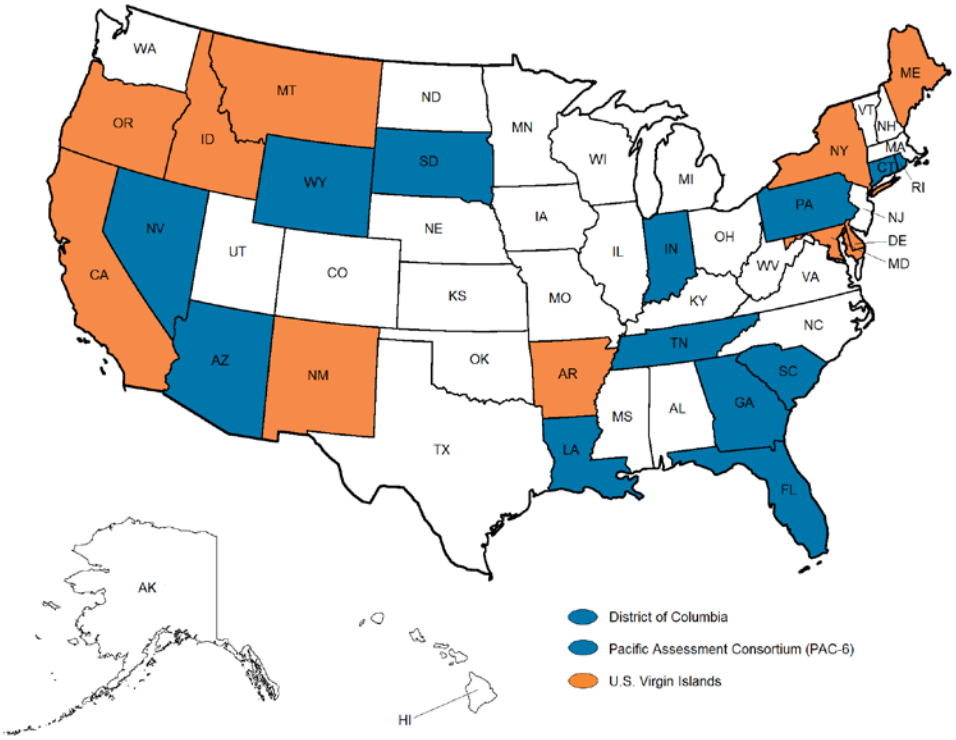
This document is available in alternative formats upon request.

National Center and State Collaborative

NCSC is a collaborative of 15 states and five organizations.

The states include (shown in blue on map): Arizona, Connecticut, District of Columbia, Florida, Georgia, Indiana, Louisiana, Nevada, Pacific Assessment Consortium (PAC-6)[1], Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, and Wyoming.

Tier II states are partners in curriculum, instruction, and professional development implementation but are not part of the assessment development work. They are (shown in orange on map): Arkansas, California, Delaware, Idaho, Maine, Maryland, Montana, New Mexico, New York, Oregon, and U.S. Virgin Islands.



*Core partner states are blue in color and Tier II states are orange in color.

[1] The Pacific Assessment Consortium (including the entities of American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of Palau, and Republic of the Marshall Islands) partner with NCSC as one state, led by the University of Guam Center for Excellence in Developmental Disabilities Education, Research, and Service (CEDDERS).

The five partner organizations include: The National Center on Educational Outcomes (NCEO) at the University of Minnesota, The National Center for the Improvement of Educational Assessment (Center for Assessment), The University of North Carolina at Charlotte, The University of Kentucky, and edCount, LLC.

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Identifying the Core Content of the Learning Progressions Framework for the Common Core State Standards for Students Who Participate in AA-AAS

Introduction

The purpose of this paper is to describe the development and prioritization of the academic content for students with significant cognitive disabilities. This prioritized academic content is referred to as Core Content Connectors (CCCs). This work is part of the NCSC GSEG and provides the foundation for the development of curriculum resources, professional development, instructional resources, and alternate assessment based on alternate achievement standards (AA-AAS). A unique feature of the development and prioritization of academic content is the use of learning progressions framework (LPF), which is built to include relationships with the Common Core State Standards (CCSSs). The LPF does not provide details of grade-specific curriculum, but describes a path for student learning as an ongoing developmental progression and is a starting point for thinking about how students develop competency in an academic domain (Hess, 2010). The following sections describe the use of LPFs for identifying specific grade-level Common Core State Standards (CCSS), and the development of the CCCs for providing more specificity for teachers.

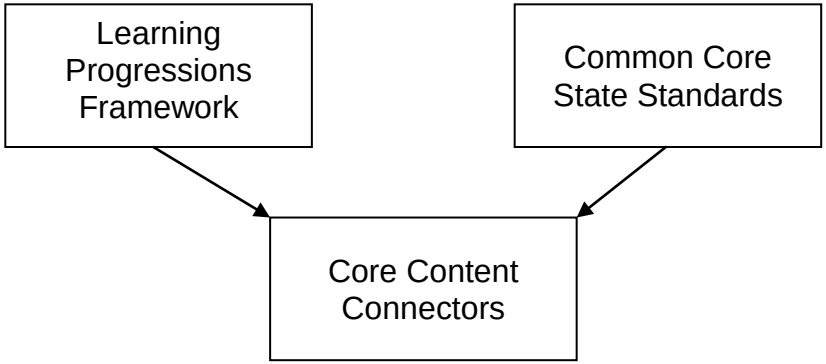
Learning Progression Framework

The National Alternate Assessment Center, under the leadership of Karin Hess, developed LPFs. Hess's (2008) definition of LPs is based on four interrelated guiding principles: (a) LPs are developed and refined using available research and evidence, (b) LPs have clear binding threads that articulate the essential core concepts and processes of a discipline sometimes referred to as the "big ideas" of the discipline, (c) LPs articulate movement towards increased understanding, and (d) LPs go hand-in-hand with well-designed and aligned assessments.

The grade span learning targets of the LPF were identified by national content experts and are a broad description of the essential content and general sequencing for student learning and skill development. The LPF does not provide details of grade-specific curriculum, but describes a path for student learning as an ongoing developmental progression. The LPF is currently available at http://www.nciea.org/publications/Math_LPF_KH11.pdf

Core Content Connectors

The Core Content Connectors (CCCs) are the prioritized academic content designed to frame the instruction and assessment of students with significant cognitive disabilities. The CCCs create a connection between the Learning Progressions Framework (LPF) and Common Core State Standards (CCSS) for these students.



The purpose of the CCCs is to identify the most salient core academic content in ELA and math found in both the CCSS and the LPF Progress Indicators (LPF PIs) (i.e., observable learning along the learning continuum for each strand in the LPFs). The CCCs illustrate the necessary knowledge and skills students with significant cognitive disabilities need to reach the learning targets or critical big ideas within the Learning Progression Frameworks (LPF, Hess et al., 2010) and the Common Core State Standard. This identified core content serves as a connection or stage between the LPF (designed for typically developing students) and the CCSS (which define grade level content and achievement). The CCCs are intentionally dually aligned with both the LPFs and the CCSSs. The CCCs identify priorities for the instruction for students in this population, and the alternate assessment. CCCs are designed to contribute to a fully aligned system of content, instruction, and assessment.

Progress Indicator: M.NO.1e describing, representing, and comparing absolute value relationships		
Core Content Connectors: 6	**CCSS Domain/Cluster**	**Common Core State Standard**
6.NO.1e1 Determine the meaning of absolute value	**Expressions and Equations** 6 NS Apply and extend previous understandings of numbers to the system of rational numbers.	6.NS.7c Understand ordering and absolute value of rational numbers. a) Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars write |-30| = 30 to describe the size of the debt in dollars.
Progress Indicator: M.NO.1f recognizing equivalence of representations using fractions, decimals, and percents and using them solve ratio problems		
Core Content Connectors: 6	**CCSS Domain/Cluster**	**Common Core State Standard**
6.NO.1f1 Find a percent of a quantity as rate per 100	**Ratios and Proportional Relationships** 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.3c Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c) Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
6.NO.1f2 Write or select a ratio to match a given statement and representation	**Ratios and Proportional Relationships** 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."
6.NO.1f3 Select or make a statement to interpret a given ratio	**Ratios and Proportional Relationships** 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

The CCCs preserve the sequence of learning outlined in the LPFs to the extent possible while disaggregating the progress indicators (which describe concepts and skills along the learning continuum for each grade span in the learning progression) into teachable and assessable segments of content. The connectors and corresponding curriculum resource guides were written to help promote how students can engage in the CCSS while following the learning progression.

The CCCs have the following characteristics:

- Sequenced according to the LPFs to help guide meaningful instruction for students and lead to enduring skills in successive grades
- Written as outcome based, which provides a description of what students should know and do
- Written at high levels of expectations for students to eliminate potential ceiling effect for student learning
- Aligned to the grade-level CCSSs to provide access to the general curriculum
- Organized by the six major LPF strands (Symbolic Expression; Nature of Numbers & Operations; Measurement; Patterns, Relations, & Functions; Geometry; and Data Analysis, Probability, & Statistics)

In some grades, CCCs were developed that were considered important for student learning but were not aligned to the LPF. CCCs for some prerequisite skills were included in some of the grades, but these CCCs are for instructional purposes and not intended as a target for assessment. At the high school level, where only one AA-AAS will be administered to students but many CCSSs and LPFs are provided, some subsets of LPF Progress Indicators were selected for developing CCCs.

All CCCs will be provided by the curriculum and instruction work group in NCSC. While states may add additional content standards as they deem necessary that is specific to the needs, states and teachers will NOT have to develop any further CCCs. The complete set will be disseminated upon completion and validation. It is anticipated that states who have adopted the Common Core State Standards can use the CCCs as the priorities for students who take AA-AAS and will not need to create other forms of translations or create extensions of the Common Core unless they choose to do so. Teachers will be able to use these, along with the various curriculum resources, to plan instruction.

Uses of the document

There are several potential uses for this document. The first is to demonstrate how the identified core content builds critical big ideas across the grades. The format is intended to show how students can grow within the linked content across the grades and the connections between the related content to help guide sequential and meaningful instructional efforts. The second potential use is to provide clarity and specificity of the content within each grade level. In the process of identifying the CCC within each of the PI, it was evident that some considerations were necessary related to the content. First, it is necessary to disaggregate the content within some of the PI to a finer grain size. As students with significant cognitive disabilities may require instruction on single concepts, PIs that include multiple concepts may need to be separated in the unpacked content. Additionally, identifying core content requires focusing on the critical big ideas within the content and the need for considering meaningful instructional context within the instruction of students who participate in the alternate assessment. The third use for this document is to demonstrate how the CCCs have direct links to the CCSS. The CCSS that are identified as having the closest match are listed beside the corresponding CCC. As these direct links indicate, the CCC are not weakly linked or “watered down” translations, but instead pinpoint the most salient content in the standard. The potential users of this document ranges from assessment designers to teachers. While the document is not intended to be a standalone instructional resource, it is intended to support teachers in their understanding of the content.

References

Hess, K. (2010, December). *Learning progressions frameworks designed for use with the Common Core State Standards in mathematics K-12.* National Alternate Assessment Center at the University of Kentucky and the National Center for the Improvement of Educational Assessment, Dover, N.H.

Hess, K. (2008). Developing and using learning progressions as a schema for measuring progress [online]. Retrieved from http://www.nciea.org/publications/CCSSO2_KH08.pdf

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	ME-1 *Explore relationships among units, attributes, and measures within a system of measurement:* • *Identify measurement attributes and units;* • *Use measurement attributes to describe and compare objects, situations, or events.*		***ME-1*** *Extend understanding of attributes and units:* • *Make conversions within measurement systems;* • *Relate measurement attributes, measures, models, and formulas.*		***ME-1*** *Explore measurable attributes, measurement systems and processes of measurement of more complex or abstract quantities.*
	Grades K-2	**Grades 3-4**	**Grades 5-6**	**Grades 7-8**	**HS**
Measurement: Conversions and Comparisons	**K.ME.1b1 Sort objects by characteristics (e.g., big/little, colors, shapes, etc.)**	**3.ME.1g1 Identify a figure as getting larger or smaller when the dimensions of the figure change**		**8.ME.1e1 Describe the changes in surface area, area, and volume when the figure is changed in some way (e.g., scale drawings)**	**H.ME.1b1 Describe the relationship between the attributes of a figure and the changes in the area or volume when 1 attribute is changed**
	K.ME.1b2 Compare 2 objects with a measurable attribute in common to see which object has more/less of the attribute (length, height, weight)		**5.ME.1b1 Convert standard measurements of time**	**8.ME.1e2 Compare area and volume of similar figures**	
	1.ME.1b3 Order up to 3 objects based on a measurable attribute (height, weight, length)		**5.ME.1b2 Convert standard measurements of length**		
	1.ME.1b4 Compare the lengths of two objects indirectly by using a third object				
	2.ME.1b5 Solve word problems involving the difference in standard length units		**5.ME.1b3 Convert measurements of mass**		

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	ME-1 *Explore relationships among units, attributes, and measures within a system of measurement:* • *Identify measurement attributes and units;* • *Use measurement attributes to describe and compare objects, situations, or events.*		***ME-1*** *Extend understanding of attributes and units:* • *Make conversions within measurement systems;* • *Relate measurement attributes, measures, models, and formulas.*		***ME-1*** *Explore measurable attributes, measurement systems and processes of measurement of more complex or abstract quantities.*
	Grades K-2	**Grades 3-4**	**Grades 5-6**	**Grades 7-8**	**HS**
			6.ME.1b4 Complete a conversion table for length, mass, time, volume		
			6.ME.1b5 Analyze table to answer questions		
Measurement: Attributes and Units	**K.ME.1a1 Describe objects in terms of measurable attributes (longer, shorter, heavier, lighter…)**	**3.ME.1a1 Tell time to the nearest 5 minutes using a digital clock**			
	1.ME.1a2 Measure using copies of 1 object to measure another	**3.ME.1f1 Select appropriate units for measurement (liquid volume, area, time, money)**	**6.ME.1a2 Identify the appropriate formula (i.e., perimeter, area, volume) to use when measuring for different purposes in a real life context**		
	1.ME.1a3 Identify minutes and hours on a digital clock	**4.ME.1f3Select appropriate units for measurement: mass, length, angles**			
	2.ME.1a4 Select appropriate unit of measurement to measure an object (ruler or yard stick;	**4.ME.1f4 Select appropriate units for the value of a set of coins or dollars**			

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	ME-1 *Explore relationships among units, attributes, and measures within a system of measurement:* • *Identify measurement attributes and units;* • *Use measurement attributes to describe and compare objects, situations, or events.*		***ME-1*** *Extend understanding of attributes and units:* • *Make conversions within measurement systems;* • *Relate measurement attributes, measures, models, and formulas.*		***ME-1*** *Explore measurable attributes, measurement systems and processes of measurement of more complex or abstract quantities.*
	Grades K-2	**Grades 3-4**	**Grades 5-6**	**Grades 7-8**	**HS**
	inches or feet)				
	2.ME.1a5 Solve word problems using dollar bills, quarters, dimes, nickles, or pennies				
	2.ME.1a6 Tell time to the nearest ½ hour using digital clocks				
	1.ME.1c1 Compare 2 units of measurement and identify which unit would require more or less when measuring a selected object (I can measure with paper clips or markers, which unit will require more to measure the table?)				
	2.ME.1c2 Measure the attributes (length, width, height) of an object using 2 different size units				

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	ME-1 *Explore relationships among units, attributes, and measures within a system of measurement:* • *Identify measurement attributes and units;* • *Use measurement attributes to describe and compare objects, situations, or events.*		***ME-1*** *Extend understanding of attributes and units:* • *Make conversions within measurement systems;* • *Relate measurement attributes, measures, models, and formulas.*		***ME-1*** *Explore measurable attributes, measurement systems and processes of measurement of more complex or abstract quantities.*
	Grades K-2	**Grades 3-4**	**Grades 5-6**	**Grades 7-8**	**HS**
	2.ME.1c3 Recognize that units can be decomposed into smaller units				
Measurement: Formulas and processes to solve problems		**3.ME.1a2 Solve word problems involving the addition and subtraction of time intervals of whole hours or within an hour (whole hours: 5:00 to 8:00, within hours: 7:15 to 7:45)**			
		3.ME.1d1 Use tiling and addition to determine area	**5.ME.1a1 Identfy the appropriate units of measurement for different purposes in a real life context (e.g., measure a wall using feet, not inches)**	**7.ME.1d1 Solve problems that use proportional reasoning with ratios of length and area**	**H.ME.1a1 Determine the necessary unit(s) to use to solve real world problems**
		3.ME.1d2 Measure area of rectilinear figures by counting squares	**6.ME.1c1 Find the area of a 2-dimensional figure and the volume of a 3-dimensional figure**		**H.ME.1a2 Solve real world problems involving units of measurement**

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	ME-1 *Explore relationships among units, attributes, and measures within a system of measurement:* • *Identify measurement attributes and units;* • *Use measurement attributes to describe and compare objects, situations, or events.*		***ME-1*** *Extend understanding of attributes and units:* • *Make conversions within measurement systems;* • *Relate measurement attributes, measures, models, and formulas.*		***ME-1*** *Explore measurable attributes, measurement systems and processes of measurement of more complex or abstract quantities.*
	Grades K-2	**Grades 3-4**	**Grades 5-6**	**Grades 7-8**	**HS**
		4.ME.1d3 **Use tiling and multiplication to determine area**	**5.ME.1d4 Use filling and multiplication to determine volume**		**H.ME.1b2** **Solve a linear equation to find a missing attribute given the area, surface area, or volume and the other attribute**
		3.ME.1f2 **Add to solve 1 step word problems**			
		4.ME.1g2 **Solve word problems using perimeter and area where changes occur to the dimensions of a rectlilinear figure**			

Progress Indicator: E.ME.1a recognizing, identifying, and describing the measurable attributes of objects		
Core Content Connectors: K	**CCSS Domain/Cluster**	**Common Core State Standard**
K.ME.1a1 Describe objects in terms of measurable attributes (longer, shorter, heavier, lighter…)	**Measurement and Data** K MD Describe and compare measurable attributes.	K.MD.1 Describe measureable attributes of objects, such as length or weight. Describe several measureable attributes of a single object.
Progress Indicator: E.ME.1b comparing and ordering objects/events according to their specified attributes (using standard or non-standard units of measure), including indirectly by using a third object, or using common referents to estimate or compare		
Core Content Connectors: K	**CCSS Domain/Cluster**	**Common Core State Standard**
K.ME.1b1 Sort objects by characteristics (e.g., big/little, colors, shapes, etc.)	**Measurement and Data** K MD Classify objects and count the number of objects in each category.	K. MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
K.ME.1b2 Compare 2 objects with a measurable attribute in common to see which object has more/less of the attribute (length, height, weight)	**Measurement and Data** K MD Describe and compare measurable attributes.	K.MD.2 Directly compare two objects with a measureable attribute in common to see which object has "more of/less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

Progress Indicator: E.ME.1a recognizing, identifying, and describing the measurable attributes of objects		
Core Content Connectors: 1	**CCSS Domain/Cluster**	**Common Core State Standard**
1.ME.1a2 Identify minutes and hours on a digital clock	**Measurement and Data** 1 MD Tell and write time.	1.MD.3 Tell and write time in hours and half-hours using analog and digital clocks.
Progress Indicator: E.ME.1b comparing and ordering objects/events according to their specified attributes (using standard or non-standard units of measure), including indirectly by using a third object, or using common referents to estimate or compare		
Core Content Connectors: 1	**CCSS Domain/Cluster**	**Common Core State Standard**
1.ME.1b3 Order up to 3 objects based on a measurable attribute (height, weight, length)	**Measurement and Data** 1 MD Measure lengths indirectly and by iterating length units.	1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.
1.ME.1b4 Compare the lengths of two objects indirectly by using a third object	**Measurement and Data** 1 MD Measure lengths indirectly and by iterating length units.	1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Progress Indicator: E.ME.1c recognizing that the smaller the unit, the more units are needed to measure an object, and that units can be decomposed/ partitioned into smaller units		
Core Content Connectors: 1	**CCSS Domain/Cluster**	**Common Core State Standard**
1.ME.1c1 Compare 2 units of measurement and identify which unit would require more or less when measuring a selected object (e.g., Measure with paper clips or markers? Which unit will require more to measure the table?)	**Measurement and Data** 1 MD Measure lengths indirectly and by iterating length units.	1.MD.2 Express length of an object as a whole number of lengths unit by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

Progress Indicator: E.ME.1a recognizing, identifying, and describing the measurable attributes of objects		
Core Content Connectors: 2	**CCSS Domain/Cluster**	**Common Core State Standard**
2.ME.1a3 Select appropriate tool and unit of measurement to measure an object (ruler or yard stick; inches or feet)	**Measurement and Data** 2 MD Measure and estimate lengths in standard units.	2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2.ME.1a4 Solve word problems using dollar bills, quarters, dimes, nickles, or pennies	**Measurement and Data** 2 MD Work with time and money.	2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*
2.ME.1a5 Tell time to the nearest ½ hour using digital clocks	**Measurement and Data** 1 MD Tell and write time.	1.MD.3 Tell and write time in hours and half-hours using analog and digital clocks.
Progress Indicator: E.ME.1b comparing and ordering objects/events according to their specified attributes (using standard or non-standard units of measure), including indirectly by using a third object, or using common referents to estimate or compare		
Core Content Connectors: 2	**CCSS Domain/Cluster**	**Common Core State Standard**
2.ME.1b5 Solve word problems involving the difference in standard length units	**Measurement and Data** 2 MD Measure and estimate lengths in standard units.	2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Progress Indicator: E.ME.1c recognizing that the smaller the unit, the more units are needed to measure an object; and that units can be decomposed/ partitioned into smaller units		
Core Content Connectors: 2	**CCSS Domain/Cluster**	**Common Core State Standard**
2.ME.1c2 Measure the attributes (length, width, height) of an object using 2 different size units	**Measurement and Data** 2 MD Measure and estimate lengths in standard units.	2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
2.ME.1c3 Recognize that standard measurement units can be decomposed into smaller units	**Measurement and Data** 2 MD Measure and estimate lengths in standard units.	2.MD.3. Estimate lengths using units of inches, feet, centimeters, and meters.

Progress Indicator: E.ME.1a recognizing, identifying, and describing the measurable attributes of objects		
Core Content Connectors: 3	**CCSS Domain/Cluster**	**Common Core State Standard**
3.ME.1a1 Tell time to the nearest 5 minutes using a digital clock	**Measurement and Data** 2 MD Work with time and money.	2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
3.ME.1a2 Solve word problems involving the addition and subtraction of time intervals of whole hours or within an hour (e.g., whole hours: 5:00 to 8:00, within hours: 7:15 to 7:45)	**Measurement and Data** 3 MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.
Progress Indicator: E.ME.1d describing and demonstrating: unit attributes, iterating, tiling, identical units, number line intervals, standardization, proportionality, additivity, and origin		
Core Content Connectors: 3	**CCSS Domain/Cluster**	**Common Core State Standard**
3.ME.1d1 Use tiling and addition to determine area	**Measurement and Data** 3 MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.	3.MD.7a Relate area to the operations of multiplication and addition. a) Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

3.ME.1d2 Measure area of rectilinear figures by counting squares	**Measurement and Data** 3 MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.	3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
Progress Indicator: E.ME.1e justifying the need for measuring with standard units as compared to non-standard units		
No CCCs written for this PI		No CCSS linked
Progress Indicator: E.ME.1f selecting the appropriate unit for measuring a given attribute (length, area, mass, liquid volume, size of angle), recognizing that a unit must have the same attributes as the object (e.g., unit of length must measure an object that has length)		
Core Content Connectors: 3	**CCSS Domain/Cluster**	**Common Core State Standard**
3.ME.1f1 Select appropriate units for measurement (liquid volume, area, time, money)	**Measurement and Data** 3 MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
3.ME.1f2 Add to solve 1 step word problems	**Measurement and Data** 3 MD Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.	3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
Progress Indicator: E.ME.1g exploring what happens to 2-dimensional measurements (perimeter or area) when the dimensions of the figure are changed		
Core Content Connectors: 3	**CCSS Domain/Cluster**	**Common Core State Standard**
3.ME.1g1 Identify a figure as getting larger or smaller when the dimensions of the figure change	**Measurement and Data** 3 MD Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.	3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Progress Indicator: E.ME.1d describing and demonstrating: unit attributes, iterating, tiling, identical units, number line intervals, standardization, proportionality, additivity, and origin		
Core Content Connectors: 4	**CCSS Domain/Cluster**	**Common Core State Standard**
4.ME.1d3 Use tiling and multiplication to determine area	**Measurement and Data** 3 MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.	3.MD.7a Relate area to the operations of multiplication and addition. a) Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
Progress Indicator: E.ME.1e justifying the need for measuring with standard units as compared to non-standard units		
No CCCs written for this PI		No CCSS linked
Progress Indicator: E.ME.1f selecting the appropriate unit for measuring a given attribute (length, area, mass, liquid volume, size of angle), recognizing that a unit must have the same attributes as the object (e.g., unit of length must measure an object that has length)		
Core Content Connectors: 4	**CCSS Domain/Cluster**	**Common Core State Standard**
4.ME.1f3 Select appropriate units for measurement: mass, length, angles		No CCSS linked
4.ME.1f4 Select appropriate units for the value of a set of coins or dollars		No CCSS linked
Progress Indicator: E.ME.1g exploring what happens to 2-dimensional measurements (perimeter or area) when the dimensions of the figure are changed		
Core Content Connectors: 4	**CCSS Domain/Cluster**	**Common Core State Standard**
4.ME.1g2 Solve word problems using perimeter and area where changes occur to the dimensions of a rectilinear figure	**Measurement and Data** 4 MD Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. 4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the*

		width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.

Progress Indicator: M.ME.1a identifying and describing measurable attributes (including area, surface area, volume, fractional units, absolute value with temperature), and selecting appropriate customary or metric units of measure when solving problems		
Core Content Connectors: 5	**CCSS Domain/Cluster**	**Common Core State Standard**
5.ME.1a1 Identify the appropriate units of measurement for different purposes in a real life context (e.g., measure a wall using feet, not inches)	**Measurement and Data** 4 MD Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*
Progress Indicator: M.ME.1b recognizing relationships among units and using proportional reasoning to convert measurements from one unit to another within the same system		
Core Content Connectors: 5	**CCSS Domain/Cluster**	**Common Core State Standard**
5.ME.1b1 Convert standard measurements of time	**Measurement and Data** 5 MD Convert like measurement units within a given measurement system.	5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
5.ME.1b2 Convert standard measurements of length	**Measurement and Data** 5 MD Convert like measurement units within a given measurement system.	5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
5.ME.1b3 Convert standard measurements of mass	**Measurement and Data** 5 MD Convert like measurement units within a given measurement system.	5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
Progress Indicator: M.ME.1c recognizing how the formulas for area and volume for a variety of shapes and solids are related		
No CCCs written for this PI		

Progress Indicator: M.ME.1a identifying and describing measurable attributes (including area, surface area, volume, fractional units, absolute value with temperature), and selecting appropriate customary or metric units of measure when solving problems		
Core Content Connectors: 6	**CCSS Domain/Cluster**	**Common Core State Standard**
6.ME.1a2 Identify the appropriate formula (i.e., perimeter, area, volume) to use when measuring for different purposes in a real life context	**Geometry** 6 G Solve real-world and mathematical problems involving area, surface area, and volume.	6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems 6.G.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
Progress Indicator: M.ME.1b recognizing relationships among units and using proportional reasoning to convert measurements from one unit to another within the same system		
Core Content Connectors: 6	**CCSS Domain/Cluster**	**Common Core State Standard**
6.ME.1b4 Complete a conversion table for length, mass, time, volume	**Ratios and Proportional Relationships** 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.3d Use ratios and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
6.ME.1b5 Analyze table to answer questions	**Ratios and Proportional Relationships** 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.3d Use ratios and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Progress Indicator: M.ME.1c recognizing how the formulas for area and volume for a variety of shapes and solids are related		
Core Content Connectors: 6	**CCSS Domain/Cluster**	**Common Core State Standard**
6.ME.1c1 Find the area of a 2-dimensional figure and the volume of a 3-dimensional figure	**Geometry** 6 G Solve real-world and mathematical problems involving area, surface area, and volume.	6.G.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Progress Indicator: M.ME.1d applying proportional reasoning to problems with ratios of length, area, and quantities measured in like or different units		
Core Content Connectors: 7	**CCSS Domain/Cluster**	**Common Core State Standard**
7.ME.1d1 Solve problems that use proportional reasoning with ratios of length and area	**Geometry** 7 G Draw, construct, and describe geometrical figures and describe the relationships between them.	7.G.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
Progress Indicator: M.ME.1e exploring what happens to 2- and 3-dimensional measurements (such as surface area, area, and volume) when the figure is changed in some way (e.g., scale drawings)		
No CCCs developed for this PI		

Progress Indicator: M.ME.1d applying proportional reasoning to problems with ratios of length, area, and quantities measured in like or different units		
No CCCs developed for this PI		

Progress Indicator: M.ME.1e exploring what happens to 2- and 3-dimensional measurements (such as surface area, area, and volume) when the figure is changed in some way (e.g., scale drawings)		
Core Content Connectors: 8	**CCSS Domain/Cluster**	**Common Core State Standard**
8.ME.1e1 Describe the changes in surface area, area, and volume when the figure is changed in some way (e.g., scale drawings)	**Geometry** 8 G Understand congruence and similarity using physical models, transparencies, or geometry software.	8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
8.ME.1e2 Compare area and volume of similar figures	**Geometry** 8 G Understand congruence and similarity using physical models, transparencies, or geometry software.	8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Progress Indicator: H.ME.1a making decisions about units and scales that are appropriate for problem-solving situations within or across mathematics disciplines or real world contexts		
Core Content Connectors: 9-12	**CCSS Domain/Cluster**	**Common Core State Standard**
H.ME.1a1 Determine the necessary unit(s) to use to solve real world problems	**Quantities** N Q Reason quantitatively and use units to solve problems.	N.Q.1 Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
H.ME.1a2 Solve real world problems involving units of measurement	**Quantities** N Q Reason quantitatively and use units to solve problems.	N.Q.1 Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Progress Indicator: H.ME.1b investigating the results when linear dimensions of objects change by some factor (e.g., area and volume change disproportionately: area in proportion to the square of the factor and volume in proportion to its cube)		
Core Content Connectors: 9-12	**CCSS Domain/Cluster**	**Common Core State Standard**
H.ME.1b1 Describe the relationship between the attributes of a figure and the changes in the area or volume	**Expressing Geometric Properties with Equations** G MG Explain volume formulas and use them to solve problems.	G.MG.1 Use geometric shapes and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

when 1 attribute is changed		
H.ME.1b2 Solve a linear equation to find a missing attribute given the area, surface area, or volume and the other attribute	**Reasoning with Equations and Inequalities** A REI Solve equations and inequalities in one variable.	A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.