


National Center and State Collaborative
General Supervision Enhancement Grant
(NCSC GSEG)

Learning Grade-specific skills
and concepts while practicing
prerequisite skills



National Center and State Collaborative

The contents of this product were developed under a grant from the Department of Education (PR/Award #: H373X100002, Project Officer: Susan Wagnert@d.gov). However, the contents do not necessarily represent the policy of the Department of Education and no assumption of endorsement by the Federal government should be made.



Welcome back to the National Center and State Collaborative's Community of Practice Webinars. In this webinar, we will discuss how to teach grade specific skills and concepts when a student is not yet demonstrating prerequisite skills.

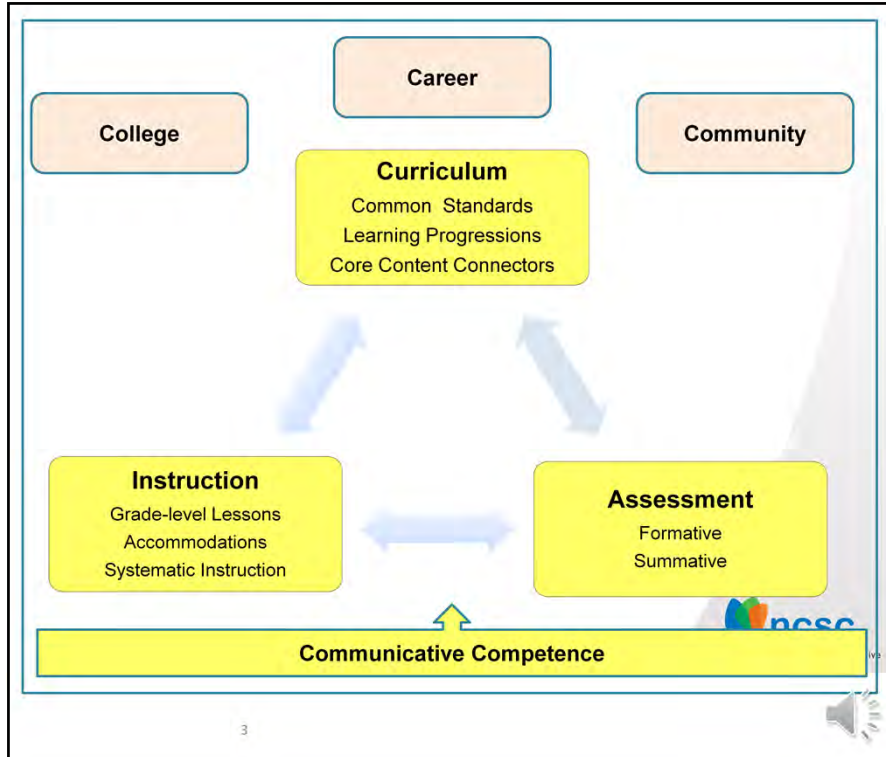
Disclaimer

- The information in this presentation is intended to support the review and refinement of training and materials developed for the NCSC GSEG.



2

This presentation is considered a draft. In keeping with the project's goal to provide quality instructional resources, feedback on the presentation and materials is welcomed and valued. Any feedback will be used to make improvements to these resources.



As you know, this instructional triangle is used as the framework for all webinars. Each component of the triangle (curriculum, instruction and assessment) informs each of the other components, which are all directed toward the goal of College, Career and Community readiness. In order for any student to benefit from challenging curriculum and high quality instruction, he or she has to be able to communicate what he or she knows and can do. Therefore, Communicative Competence is the base. This webinar will focus on the instructional component of the triangle.

Goals & Outcomes

- Define prerequisite skills
- Examine how prerequisite skills are embedded within grade level instruction
- Gain useful tips on how to blend instruction on grade-specific skills and concepts while also working on prerequisite skills



Many teachers ask how can students be taught grade-specific skills and concepts when they don't yet have the prerequisite skills.

The goals of this webinar will examine that dilemma, by

Defining prerequisite skills, so that we are all on the same page when we use that term
Examine how prerequisite skills are embedded within instruction on grade-specific skills and concepts

And gain useful tips on how to teach grade-specific skills and concepts while also working on prerequisite skills

Prerequisite Skills

- Prerequisite - necessary as a prior condition
- Functional - skills that will enhance a persons independence in the next critical environment, and are embedded in natural routines and socially valid contexts

Is there a difference?



Let's begin by defining what we mean by prerequisite skills and, while we are at it, let's define functional skills.

Prerequisite skills are defined as skills that are necessary as a prior condition for something else to happen or exist. Therefore prerequisite skills describe the skills or background knowledge a student needs (prior condition) before working on a specified concept.

Maryland School performance website

<http://mdk12.org/instruction/prereqs/mathematics/grade6/3C1b.html>

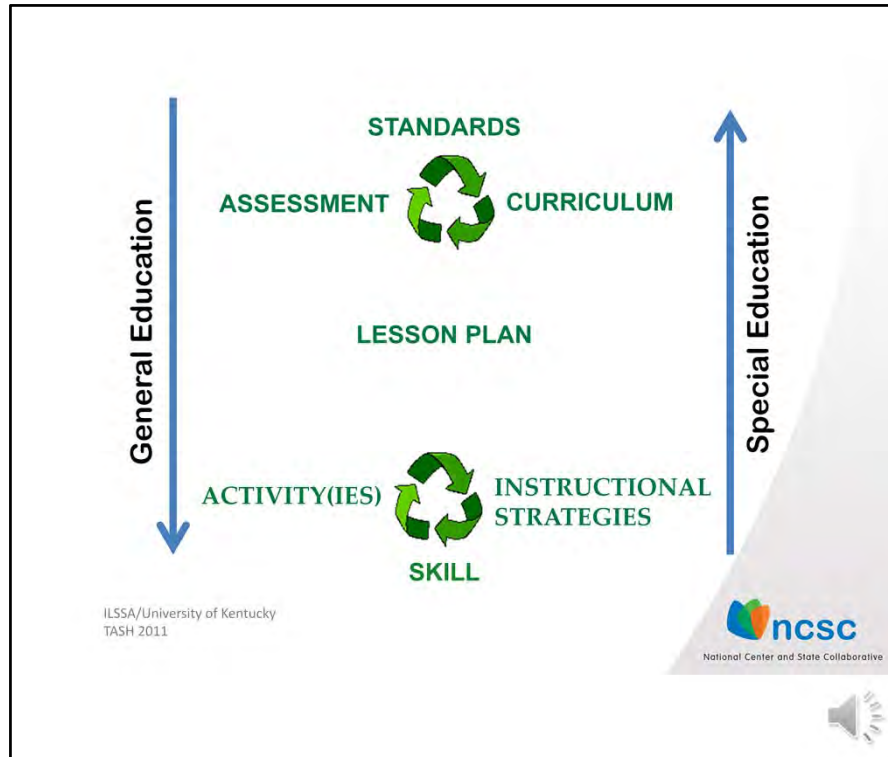
Teachers also ask where "functional skills" fit in standards-based instruction, so let's look at the definition of functional.

Functional skills are those skills that enhance a persons independence in the next critical environment, and are embedded in natural routines and socially valid contexts.

Let's think about what that means for school aged children. What are the next critical environments for a student? If a student is in the first grade, the next critical environment is the 2nd grade, if a student is in 8th grade, the next critical environment is 9th grade, and if a student is in the 12th grade, the next critical environment is college, career and community.

So what are the skills students need in their next critical environments to be as independent and successful as possible?

Is there a difference between prerequisite skills related to the grade level standards-based instruction and functional skills? Think about this as we go through this webinar.



Planning standards based instruction on the CCSS, is most successful when designed in a top down or backwards manner. According to Wiggins and McTighe, “Effective curriculum is planned backward from long-term, desired results through a three-stage design process (Desired Results, Evidence, and Learning Plan)” starting with the standard, determine what the outcomes of instruction should be and how the student will demonstrate those outcomes, then plan the lessons, activities, and so that students obtain the specific skills, concepts and strategies needed to demonstrate those outcomes. “This process helps avoid the common problems of treating the textbook as the curriculum rather than a resource, and to avoid activity-oriented teaching in which no clear priorities and purposes are apparent.”

Historically, special education has planned and instructed from the bottom up, starting with specific, discrete skills or activities and then trying to determine where they “fit” within the standards and outcomes.

When we start with a specific skill

We can usually end up teaching that skill in isolation. For example:

Skill

- Increase sight word vocabulary

Instruction

- Mass Trial with Flashcards
 - Sat
 - Cat
 - Blue
 - Red
- Predictable /Controlled Reading Materials
 - Matt sat on a cat.
 - The blue horse is in the red box.



ILSSA/University of Kentucky TASH 2011



Let's take a look at instruction that begins with a specific skill. In this example, instruction begins with the skill of "increase sight word vocabulary" and includes two activities, mass trial practice of words in isolation, and then practice reading within a controlled reading text.

Although students will acquire sight word reading skills in this scenario, it is done in isolation, removed from standards-based instruction and removed from the context of what peers are reading and talking about. It is missing the purpose for why we learn and use these words.

Starting with the Standards

Important to note that instructing on the CCSS and assessing the CCSS have different parameters

Instruction

- May include some prerequisite skills to build toward the final concept/skill
- Range of skills

Assessment

- Focuses on only the final concept/skill
- Usually targets single DOK per item



It is important to remember the difference between instruction and assessment when planning. During instruction students use, and therefore we teach, a variety of skills and strategies that build to the grade-specific concept. However, during assessment we typically target a specific skill or concept.

It is important to understand the difference between instruction and assessment on grade specific concepts that embed the use of prerequisite skills in the problem solving process:

During instruction you can teach students to identify numbers, count, or use one-to-one correspondence within the concept of solving for area and perimeter. You can provide direct instruction on the prerequisite skills within the process of solving for the area and perimeter. Because the prerequisites are used over and over within the concept, the student can receive lots of functional practice on using the skills in context, not in isolation

During Assessment, you are looking for performance of specific skills:

You might be doing progress monitoring on whether the student is learning/using the prerequisite skills, a system of least prompts or time delay strategy might be used and data recorded to keep track. Or you might use observational data during the activities within the lesson to see how the student is performing. You might be doing formative assessment to see which steps within the concept the student is learning, and which steps still need continued instruction. You may be checking on whether the student is using the processes, steps, strategies taught to solve problems; you may be looking for independent responses or allowing for a system of least prompts

You might be large scale assessment to show student performance of the grade specific concept. At this point the student should be independently utilizing steps strategies supports to evidence performance of grade specific concepts.

Assessment may focus on one or even two concepts or skills while instruction should scaffold from old skills while building new ones

As a part of this distinction, it is important to note that during instruction we expect people to hit a range of DOK levels from the lowest to the highest. However, during assessment we may target one DOK level and it may not be the highest one.

Assessment may focus on one or even two concepts or skills while instruction should scaffold from old skills while building new ones

Standards-Based Instruction

Standard: CCSS.ELA-Literacy.RL.1.4 Identify words and phrases in stories or poems that suggest feelings or appeal to the senses

Instruction

- Unit of lessons that
 - Determine the “big idea” and the desired results of instruction
 - Determine how performance of the concept will be demonstrated
 - Design lessons and activities that build on one another to get to the “big idea” of the standard
 - Include a variety of activities/learning opportunities
 - Utilize grade-level texts that use vocabulary in context
 - Include formative assessments to shape consequent instruction
 - Embed other skills the student needs while focusing on the standard

 National Center and State Collaborative

IL55A/University of Kentucky TASH 2011



Now let's see how instruction looks when we start with the standards. Using the first grade common core state standard of “Identify words and phrases in stories and poems that suggest feelings or appeal to the senses”...

Begin with the big idea – reading words/phrases in context, read words/phrases that appeal to feelings or the senses. Then it is important to determine how students will demonstrate achievement of that standard. (Students will identify words that suggest feelings/sense and match to the feeling or sense it suggests)

Once the outcome has been determined, a variety of activities that lead the student toward acquisition of the skills necessary to demonstrate the outcome can be designed. Specific strategies and supports should also be designed and implemented. Formative assessments and/or progress monitoring should be utilized to shape instruction and help determine if intervention strategies or prerequisite skills are needed.

Standards-Based Instruction

Standard: 1.RL.4 "Identify words and phrases in stories and poems that suggest feelings or appeal to the senses." (from the Common Core State Standards)

"He knocked on the front door.
There was no answer.
"Toad, Toad," **shouted** Frog,
"wake up. It is spring!"
"**Blah**," said a voice from inside the house.
"Toad! Toad! **cried** Frog."

- from *Frog and Toad Are Friends* by Arnold Lobel



ILSSA/University of Kentucky TASH 2011



Here is an example of one activity designed with the end in mind. The example allows for instruction on the standards using grade level text. The targeted words that “suggest feelings,” are highlighted in red. The specific skill of reading sight words is embedded within the instruction and the words are underlined.

So you can see, the skill of increasing sight word vocabulary can still be achieved while addressing the standard and allowing the student to work with the same materials as peers. This also naturally provides opportunities for communicating with peers on a shared topic.

Tiered intervention Strategies can be designed based on formative assessment data, and might include mass trial practice of the target words prior to instruction to help build background knowledge or prepare the student for instruction; and the use of controlled reading materials. And of course all materials should be presented using the student’s mode of communication.

Elementary Measurement Unit

Table of Contents

Unit Key Vocabulary	1
Unit Standards Overview	3
Lesson 1 of the Unit	
Lesson Materials and Vocabulary	6
Lesson Introduction – Nonstandard Units of Measure	8
Lesson Body – Standard Units of Measure	10
Lesson Practice – Standard Units of Measure – Measurement Activity	13
Lesson Closure – Standard Units of Measure – Measurement Exit Assessment	16
Lesson 2 of the Unit	
Lesson Materials and Vocabulary	18
Lesson Introduction – Units within the Same System of Measurement	19
Lesson Body – Converting Units – Feet and Inches	21
Lesson Practice - Converting Units – Feet and Inches	21
Lesson Closure – Converting Units – Feet and Inches Exit Assessment	23
Lesson 3 of the Unit	
Lesson Materials and Vocabulary	25
Lesson Introduction – The Metric System	27
Lesson Body – Metric Units of Measure – Measurement Activity	28
Lesson Practice – Converting Units – Meters and Centimeters	30
Lesson Closure – Converting Units – Meters and Centimeters Exit Assessment	31
Lesson 4 of the Unit	
Lesson Materials and Vocabulary	34
Lesson Introduction – Area and Perimeter	36
Lesson Body – Area and Perimeter – PowerPoint Presentation	37
Lesson Practice – Solve for Area and Perimeter	39
Lesson Closure – Solve for Area and Perimeter – Exit Assessment	40
Culminating Activity of the Unit	
Lesson Materials	44
Lesson Introduction – Review Previous Problem and Strategies	44
Lesson Body – Review Activity – Measurement Stations	46
Lesson Final Assessment – Solve Story Problem	49

SC
the Collaborative



Using the NCSC sample UDL Units on Measurement and Geometry, we will look at the grade-specific skills and concepts addressed within each lesson and activity, and then determine the prerequisite skills embedded within the instruction.

Using the table of contents from the Elementary Measurement Unit, **click**

Elementary Measurement Unit

Table of Contents

Unit Key Vocabulary	1
Unit Standards Overview	3
Lesson 1 of the Unit	
Lesson Materials and Vocabulary	6
Lesson Introduction – Nonstandard Units of Measure	8
Lesson Body – Standard Units of Measure	10
Lesson Practice – Standard Units of Measure – Measurement Activity	13
Lesson Closure – Standard Units of Measure – Measurement Exit Assessment	16

Instructional Family: Sorting and Classifying Core Content Connectors (CCCs) addressed: <ul style="list-style-type: none"> • 4.ME.2e4 Select appropriate tool for measurement: ruler • 2.ME.1a3 Select appropriate unit of measurement to measure an object (ruler or yard stick; inches or feet) 	Prerequisite skills: Match numbers Identify numbers Count One-to-one correspondence Parts-to-whole
Instructional Family: Measuring Using Tools CCCs addressed: <ul style="list-style-type: none"> • 2.ME.1c2 Measure the attributes (length, width, height, mass) using standard size units • 2.ME.1c3 Recognize that units can be decomposed into smaller units • 2.ME.2b2 Select appropriate tools and demonstrate or identify appropriate measuring techniques 	
Instructional Family: Problem solving using measurement process. Core Content Connectors (CCCs) addressed: <ul style="list-style-type: none"> • 3.ME.2e3 Measure to solve problems using number lines and ruler to 1 inch, $\frac{1}{2}$ inch, or $\frac{1}{4}$ of an inch • 2.ME.1a3 Select appropriate unit of measurement to measure an object (ruler or yard stick; inches or feet) 	
Instructional Family: Scaling and Unit conversion CCCs addressed: <ul style="list-style-type: none"> • 4.ME.2f1 Complete a conversion table for length and mass within a single system 	

we see that the skills addressed within the first three lessons include measurement using non-standard and standard units, and converting units .

Here is the list of the Core Content Connectors addressed within these first 3 lessons.

Using the CCCs, analyze the concepts to consider the prerequisite skills embedded within these concepts:

- Prerequisite skills used by students to demonstrate the concepts might include:
- Match numbers (numbers from a ruler to the correct answer when measuring)
 - Identify numbers (on rulers, in multiple choice answers, last number counted)
 - Count (number of units, number of manipulatives used to ...)
 - One-to-one correspondence (one unit to one corresponding ...)
 - Parts-to-whole (inches to feet, feet to yards, centimeters to meters)

Elementary Measurement Unit

Instructional Family: Sorting and Classifying	
Core Content Connectors (CCCs) addressed:	
<ul style="list-style-type: none"> • 4.ME.2e4 Select appropriate tool for measurement: mass, length, angles • 2.ME.1a3 Select appropriate unit of measurement to measure an object (ruler or yard stick; inches or feet) 	
Instructional Family: Measuring Using Tools	
CCCs addressed:	
<ul style="list-style-type: none"> • 4.ME.1d3 Use tiling and multiplication to determine area • 3.ME.1d1 Use tiling and addition to determine area • 3.ME.1d2 Measure area of rectilinear figures by counting unit squares • 2.ME.2b2 Select appropriate tools and demonstrate measuring techniques 	
Instructional Family: Problem solving using measurement	
Core Content Connectors (CCCs) addressed:	
<ul style="list-style-type: none"> • 3.ME.2e3 Measure to solve problems using number lines or $\frac{1}{4}$ of an inch • 2.ME.1b5 Solve word problems involving the difference between two quantities 	
Instructional Family: Perimeter, Area, Volume	
CCCs addressed:	
<ul style="list-style-type: none"> • 4.ME.2h1 Apply the formulas for area and perimeter to solve real world problems • 3.ME.2h Use addition to find the perimeter of a rectangle 	
Culminating Activity of the Unit	
Lesson Materials	44
Lesson Introduction – Review Previous Problem and Strategies	44
Lesson Body – Review Activity – Measurement Stations	46
Lesson Final Assessment – Solve Story Problem	49

Prerequisite skills:
 Match numbers
 Identify numbers
 Count
 One-to-one correspondence
 Parts-to-whole
 Addition
 Multiplication



In the last two lessons of this units include the concepts of area and perimeter and the skill of determining the area and perimeter of various two dimensional shapes.

Here is the list of the Core Content Connectors addressed within these 2 lessons.

You'll notice that the same prerequisite skills embedded within the first three lessons are also embedded and used to demonstrate the skills in the last two lessons, with the inclusion of
 Addition
 Multiplication

Each lesson ends with a formative assessment piece, that allows for collection of observational data or progress monitoring on how the student is performing the skill and using the strategies, processes, and supports included.

Middle School Measurement Unit

Table of Contents

Unit Key Vocabulary	1
Unit Standards Overview	3
Lesson 1 of the Unit	
Lesson Materials and Vocabulary	6
Lesson Introduction – Attributes of Common Shapes	8
Lesson Body – Area of Common Shapes	11
Lesson Practice – Solve for Area	16
Lesson Closure – Solve for Area	17
Lesson 2 of the Unit	
Lesson Materials and Vocabulary	20
Lesson Introduction – Measuring Complex Shapes	21
Lesson Body – Solve for Area of Complex Shapes	24
Lesson Practice – Solve for Area of Complex Shapes	27
Lesson Closure – Solve for Area of Complex Shapes	28
Lesson 3 of the Unit	
Lesson Materials and Vocabulary	31
Lesson Introduction – Three-Dimensional Shapes and Nets	32
Lesson Body – Three-Dimensional Shapes, Nets and Surface Area	35
Lesson Practice – Solve for Surface Area of Three-Dimensional Shapes	39
Lesson Closure – Solve for Surface Area of Three-Dimensional Shapes	40
Lesson 4 of the Unit	
Lesson Materials and Vocabulary	43
Lesson Introduction – Review Surface Area and Introduce Volume	44
Lesson Body – Solve for Volume	46
Lesson Practice – Solve for Volume	49
Lesson Closure – Solve for Volume	50
Culminating Activity of the Unit	
Lesson Materials	53
Lesson Introduction – Review Previous Problem and Strategies	54
Lesson Closure – Solve Story Problem Related to Volume and Surface Area	55

ICSC
14 State Collaborative



Now let's review the skills and concepts addressed in the Middle School unit. Notice how the concept has progressed from the elementary unit on measurement of basic two dimensional shapes, perimeter and area to measurement of complex and three dimensional shapes, surface area and volume.

Middle School Measurement Unit		
Table of Contents		
Unit Key Vocabulary	1	
Unit Standards Overview	3	
Lesson 1 of the Unit		
Lesson Materials and Vocabulary	6	
Lesson Introduction – Attributes of Common Shapes	8	
Lesson Body – Area of Common Shapes	11	
Lesson Practice – Solve for Area	16	
Lesson Closure – Solve for Area	17	
Instructional Family: Geometric Problems		
CCCs addressed:	Prerequisite skills: Match numbers Identify numbers Count One-to-one correspondence Parts-to-whole Addition Multiplication Match shapes Identify shapes	
<ul style="list-style-type: none"> 7.GM.1h3 Find area of plane figures and surface area 7.GM.1h4 Find area of an equilateral, isosceles, and 6.GM.1d1 Find area of quadrilaterals 6.GM.1d2 Find area of triangles 		
Instructional Family: Recognizing, Describing, Naming		
CCCs addressed:		
<ul style="list-style-type: none"> 5.GM.1a1 Recognize properties of simple plane figures 4.GM.1h2 Classify two-dimensional shapes based on 2.GM.1b3 Distinguish two- or three-dimensional shapes by sides, equal or different lengths of sides, # of faces, # 		
Instructional Family: Perimeter, Area, Volume		
CCCs addressed:		
<ul style="list-style-type: none"> 6.ME.2a3 Apply the formula to find the area of triangles 6.ME.2b2 Decompose complex shapes (polygon, trapezoid, pentagon) into simple shapes (rectangles, squares, triangles) to measure area 6.ME.1c1 Find the area of a 2-dimensional figure and the volume of a 3-dimensional figure 6.ME.1a2 Identify the appropriate formula (i.e., perimeter, area, volume) to use when measuring for different purposes in a real life context 		

As you look at the skills addressed within the first lesson of this unit, you see instruction focuses on attributes of common shapes and area and perimeter of those shapes.

Here is the list of the Core Content Connectors addressed within this lesson.

Using the CCCs, analyze the concepts to consider the prerequisite skills embedded within these concepts:

Prerequisite skills embedded within/used to demonstrate the skills and concepts include Match numbers (which might be used when...

Identify numbers (on rulers, ...

Count (number of units...

One-to-one correspondence (one unit to one corresponding ...

Parts-to-whole (inches to feet, feet to yards, centimeters to meters)

Addition and multiplications.

These are all the same prerequisite skills taught and used within the elementary unit. The student will continue to use those skills embedded throughout the middle school unit.

In addition, the middle school unit includes the prerequisite skills of identifying and matching shapes.

Middle School Measurement Unit

Instructional Family: Geometric Problems

- CCCs addressed:
- **7.GM.1h1** Add the area of each face of a prism to find surface area of three dimensional objects
 - **7.GM.1h2** Find the surface area of three-dimensional figures using nets of rectangles or triangles
 - **7.GM.1h3** Find area of plane figures and surface area of solid figures (quadrilaterals)
 - **7.GM.1h4** Find area of an equilateral, isosceles, and scalene triangle
 - **6.GM.1d1** Find area of quadrilaterals
 - **6.GM.1d2** Find area of triangles

Lesson 2 of the Unit

Lesson Materials and Vocabulary	
Lesson Introduction – Measuring Complex Shapes	
Lesson Body – Solve for Area of Complex Shapes	
Lesson Practice - Solve for Area of Complex Shapes	
Lesson Closure – Solve for Area of Complex Shapes	

Instructional Family: Recognizing, Describing, Naming and Classifying

- CCCs addressed:
- **5.GM.1a1** Recognize properties of simple plane figures

Instructional Family: Perimeter, Area, Volume

- CCCs addressed:
- **7.ME.2c1** Solve one step real world measurement problems in terms of two- and three-dimensional objects
 - **6.ME.2a3** Apply the formula to find the area of triangles
 - **6.ME.2b2** Decompose complex shapes (polygon, trapezoid, pentagon) into simple shapes (rectangles, squares, triangles) to measure area
 - **6.ME.1c1** Find the area of a 2-dimensional figure and the volume of a 3-dimensional figure
 - **6.ME.1a2** Identify the appropriate formula (i.e., perimeter, area, volume) to use when measuring for different purposes in a real life context

- Prerequisite skills:**
- Match numbers
 - Identify numbers
 - Count
 - One-to-one correspondence
 - Parts-to-whole
 - Addition
 - Multiplication
 - Match shapes
 - Identify shapes
 - Area

The second and third lessons of this units include the concepts of area of complex shapes and surface area of three dimensional shapes based on the shape’s net.

You’ll notice that the same prerequisite skills embedded within the first lesson are also embedded and used to demonstrate the skills in these two lessons, with the inclusion of area. The understanding and use of area has now become a prerequisite skill used within the concept of surface area.

Middle School Measurement Unit

Instructional Family: Geometric Problems	
CCCs addressed: <ul style="list-style-type: none"> 7.GM.1h1 Add the area of each face of a prism to find surface area of three dimensional objects 7.GM.1h2 Find the surface area of three-dimensional figures using nets of rectangles or triangles 7.GM.1h3 Find area of plane figures and surface area of solid figures (quadrilaterals) 7.GM.1h4 Find area of an equilateral, isosceles, and scalene triangle 6.GM.1d1 Find area of quadrilaterals 6.GM.1d2 Find area of triangles 	
Instructional Family: Recognizing, Describing, Naming	
CCCs addressed: <ul style="list-style-type: none"> 5.GM.1a1 Recognize properties of simple plane figures 	
Instructional Family: Perimeter, Area, Volume	
CCCs addressed: <ul style="list-style-type: none"> 7.ME.2c1 Solve one step real world measurement problems involving surface area of two- and three-dimensional objects 6.ME.2a3 Apply the formula to find the area of triangles 6.ME.2b2 Decompose complex shapes (polygon, trapezoid, circle) into simpler shapes (rectangles, squares, triangles) to measure area 6.ME.1c1 Find the area of a 2-dimensional figure and the perimeter of a figure 6.ME.1a2 Identify the appropriate formula (i.e., perimeter, area, volume) to use when measuring for different purposes in a real life context 5.ME.2b1 Use filling and multiplication to determine volume 5.ME.2b2 Apply formula to solve one step problems involving volume 	Prerequisite skills: Match numbers Identify numbers Count One-to-one correspondence Parts-to-whole Addition Multiplication Match shapes Identify shapes Area

The last two lessons continue instruction on surface area and add in the concept of volume

Notice how the same prerequisite skills embedded and used in the Elementary lessons continue to be used to demonstrate the grade level concepts in the middle school unit. You will also notice that the **learning has progressed** so that the student is using the same prerequisite skills, but the processes, strategies and concepts are more sophisticated.

High School Geometry Unit

Unit Key Vocabulary

Unit Standards Overview

Lesson 1 of the Unit

Lesson Materials and Vocabulary	6
Lesson Introduction – Area and Perimeter	8
Lesson Body – Compare Area and Perimeter	11
Lesson Practice – Area and Perimeter - Converting Units within the Same System	15
Lesson Closure – Solve for Area and Perimeter within Authentic Situation	17

Lesson 2 of the Unit

Lesson Materials and Vocabulary	25
Lesson Introduction – Ratios and Proportions	27
Lesson Body – Compare Area of Rectangles Using Ratios	28
Lesson Practice - Compare Area of Rectangles Using Ratios	30
Lesson Closure – Analyze the Effect on Area When a Dimension is Changed by a Factor “n”	30

Lesson 3 of the Unit

Lesson Materials and Vocabulary	34
Lesson Introduction – Review Ratios and Proportion	35
Lesson Body – Convert Units With in a Measurement System Using Ratio and Proportion	36
Lesson Practice – Solve Conversion Problems using Ratio and Proportion	40
Lesson Closure – Solve Conversion Problems using Ratio and Proportion	43

Lesson 4 of the Unit

Lesson Materials and Vocabulary	48
Lesson Introduction Review Area, Perimeter, Ratio, and Proportions to Brainstorm New Problem	49
Lesson Body – Collect Information on Area of Dance Floor Needed Per Couple (Unit Rate)	51
Lesson Practice – Solve the Problem Involving Unit Rate (Person per Feet ²)	53
Lesson Closure – Solve Same Problem Involving Unit Rate using Different Dimension	55

Lesson 5 of the Unit

Lesson Vocabulary	60
Lesson Introduction – Review Previous Problem and Strategies to Brainstorm New Problem	61
Lesson Body – Solve Unit Rate in Authentic Problem	63
Lesson Practice – Continue to Practice Unit Rate using Different Dimensions	67
Lesson Closure – Create and Solve Own Authentic Problem Involving Unit Rate	68

Lesson 6 of the Unit

Culminating Activity	76
----------------------------	----

SC
Collaborative



In the High School unit, we see the concepts of ratio and proportion throughout and the skills of determining unit rate and converting units of measure to determine equivalent ratios.

High School Geometry Unit

Unit Key Vocabulary
 Unit Standards Overview
 Lesson 1 of the Unit
 Lesson Materials and Vocabulary.....
 Lesson Introduction – Area and Perimeter
 Lesson Body – Compare Area and Perimeter
 Lesson Practice – Area and Perimeter - Converting Units within the Same System.....
 Lesson Closure – Solve for Area and Perimeter within Authentic Situation.....

Instructional Family: Problem solving using measurement p

Core Content Connectors addressed:

- **H.ME.1a1** Determine the necessary unit(s) to use to solve real world problems involving units of measurement.
- **H.ME.1a2** Solve real world problems involving units of measurement.
- **3. ME.1g1** Identify a figure as getting larger or smaller when scaled.

Instructional Family: Perimeter, Area, Volume

Core Content Connectors addressed:

- **8.ME.1e2** Compare area and volume of similar figures.
- **6.ME.1a1** Identify the appropriate formula (i.e., perimeter, area, volume) for a given situation and apply it to solve problems in different purposes in a real life context.
- **4.ME.2h1** Apply the formulas for area and perimeter to solve real world problems.
- **3.ME.2h** Use addition to find the perimeter of a rectangle.

Instructional Family: Scaling and Unit conversion

Core Content Connectors addressed:

- **8.ME.1e1** Describe the changes in surface area, area, and volume when the figure is changed in some way (e.g., scale drawings)
- **5. ME.2a1** Solve problems involving conversions of standard measurement units when finding area, volume, time lapse, or mass.
- **5. ME.1b2** Convert standard measurements of length.

Prerequisite skills:
 Match numbers
 Identify numbers
 Count
 One-to-one correspondence
 Parts-to-whole
 Addition
 Multiplication
 Area
 Perimeter

As you look at the skills addressed within the first lesson of this unit, you see students are expected to demonstrate area and perimeter of similar figures.

Here is the list of CCCs addressed

As you think about the Prerequisite skills embedded, you will notice that they are the same as those addressed in the elementary and middle school units.

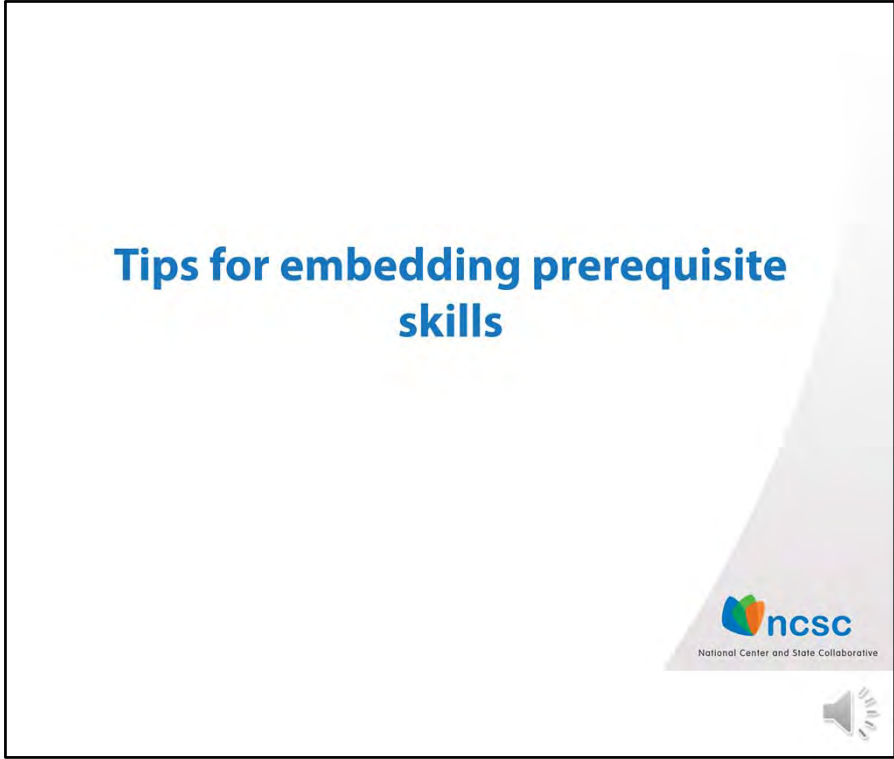
High School Geometry Unit

Instructional Family: Problem solving using measurement process.	
Core Content Connectors addressed:	
• H.ME.1a1 Determine the necessary unit(s) to use to solve real world problems involving units of measurement.	
• H.ME.1a2 Solve real world problems involving units of measurement.	
Instructional Family: Perimeter, Area, Volume	
Core Content Connectors addressed:	
• 8.ME.1e2 Compare area and volume of similar figures.	
• 6.ME.1a1 Identify the appropriate formula (i.e., perimeter, area, volume) for different purposes in a real life context.	
Instructional Family: Scaling and Unit conversion	
Core Content Connectors addressed:	
• H.ME.2b5 Apply the formula of geometric figures to solve design problems involving an object or structure to satisfy physical restraints or minimize cost.	
• H.ME.2b1 Determine the dimensions of a figure after dilation.	
• 8.ME.1e1 Describe the changes in surface area, area, and volume of similar figures some way (e.g., scale drawings)	
• 7.ME.1d1 Solve problems that use proportional reasoning with ratios of length and area	
• 7.PRF.1e1 Determine unit rates associated with ratios of lengths, areas, and other quantities measured in like units	
• 5.ME.2a1 Solve problems involving conversions of standard measurement units when finding area, volume, time lapse, or mass.	
• 5.ME.1b2 Convert standard measurements of length.	
Lesson Body – Solve Unit Rate in Authentic Problem	63
Lesson Practice – Continue to Practice Unit Rate using Different Dimensions	67
Lesson Closure – Create and Solve Own Authentic Problem Involving Unit Rate	68
Lesson 6 of the Unit	
Culminating Activity.....	76

- Prerequisite skills:**
- Match numbers
 - Identify numbers
 - Count
 - One-to-one correspondence
 - Parts-to-whole
 - Addition
 - Multiplication
 - Area
 - Perimeter

The remaining lessons of this unit include the concepts of ratios and unit rate within the context of area.

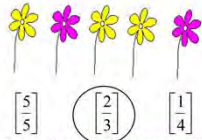
Prerequisite skills embedded within and used to demonstrate the skills and concepts are the same as all previous lessons and grades.



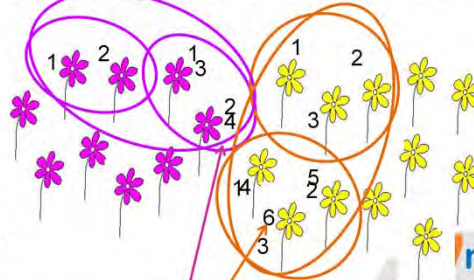
So let's look at how we can use and teach prerequisite skills while demonstrating the grade-specific skills and concepts.

Ratios

- Given a bouquet consisting of 2 pink flower and 3 yellow flowers, write the ratio of number of pink flowers to number of yellow flowers found in the bouquet.



- Use the flowers below to make two bouquets, keeping the same ratio of pink flowers to yellow flowers.



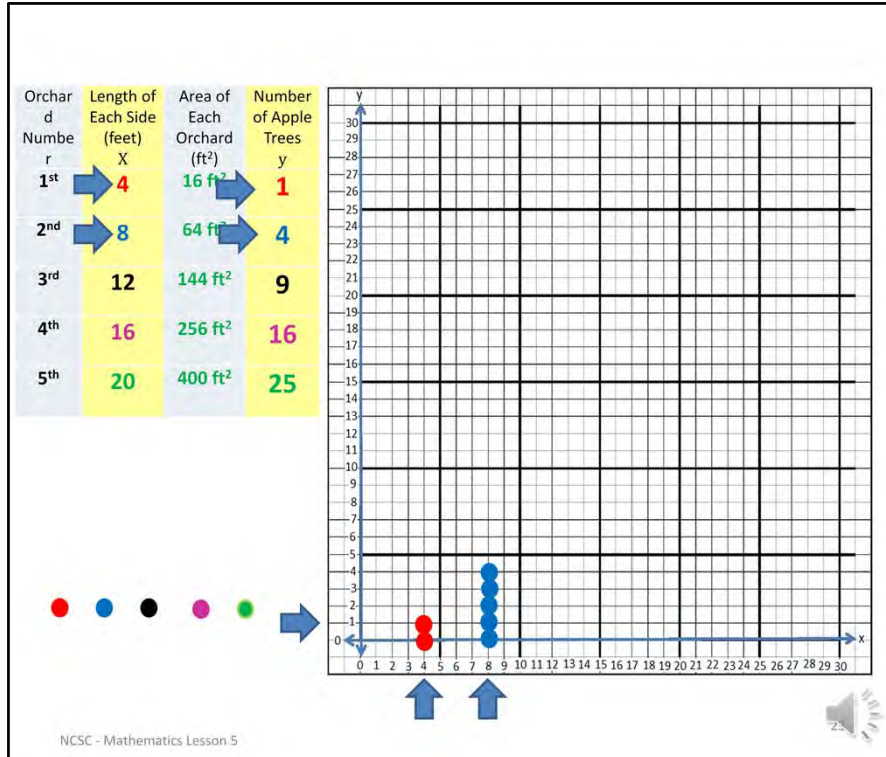
- Circle the equivalent ratio



ncsc
ner and State Collaborative



When working on ratios and equivalent ratios, students begin by determining unit rate. Students can create models of the unit rate by counting the correct number of corresponding colors and circling to create two new bouquets. **Click.** During instruction, a teacher can model the process and reinforce prerequisite skills by writing the numbers 1, 2 and 1, 2, 3 by each grouping. Student can repeat that step to create several models of the ratio 2:3. Next model for the students how to group all the pink groups together and all the yellow groups together. **Click** Have student count the total and match the total number of each to the numerical representation of the ration. **Click**



This is one example of embedding prerequisite skills in the concept of graphing coordinate pairs

A student can learn to plot points of a coordinate grid by learning the concept of run and rise, coordinate pairs, (x,y) coordinates, by matching the numbers to determine where the point will go and naming the numbers **Click**, or counting run and rise to plot points **Click**. In doing so, the student is working learning the concept of graphing and practicing the skills of identifying numbers and counting.

Math Example

CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

Instructional Steps

1. Students will identify the numbers in a word problem.
2. Students will identify the important words from a word problem.
3. Students will model a word problem using manipulatives
4. Students will choose the equation that best represents a word problem.

Assessment Items

1. Students will write the following as an equation (by choosing the best option) and solve.

Joe and Sayeed bought a total of 20 video games. Joe bought 9 games. How many games did Sayeed buy?



Let's look at how to incorporate the first of the standards for mathematical practice: Make sense of problems and persevere in solving them.

Word problems are used as a context for demonstrating understanding of a variety of math concepts across the grade bands from K-12. As students move from one grade to the next, they continue to solve word problems, the difference found from one grade to the next is the complexity of the word problem and the complexity of the number systems used.

During instruction, the student is taught how to work through all the steps of a process for solving problems and may include emphasis on practicing/learning prerequisite skills at the same time. Whereas assessment is looking for the end result related to the standard only. The grade-specific concepts and activities give purpose for using those prerequisite skills. We need to recognize numbers when solving problems, we need to use one to one correspondence when solving problems, we need to add/subtract/multiply/divide when solving problems, whether those problems are related to patterns and algebra, geometry and measurement, data analysis.

We will go through each step of this activity and think about strategies to use to not only teach the grade level concept, but to practice the prerequisite skills as needed.

Math Example

Joe and Sayeed bought a total of **20** video games. Joe bought **9** games. How many games did Sayeed buy?

Instructional Steps

1. Students will identify the numbers in a word problem. (*prior to this step, do a short lesson on number identification*)

Prior to this step, do a short lesson on number identification, using errorless learning techniques.

Then have the student apply this skill by finding and identifying the numbers in the word problem. This is instruction, so a variety of errorless learning strategies, as well as supports may be used to help the student learn to perform the skill accurately.



In step one of this process for solving problems, students will identify the numbers in a word problem.

In order to make sense of a problem, a student must be able to identify the important numbers of the problem. Identifying or naming numbers is a prerequisite skill, and can be practiced prior to the lesson using a variety of errorless learning techniques. The student can then apply the skill of identifying numbers, by finding the numbers in the word problem.

Math Example

Joe and Sayeed bought a **total** of 20 video games. Joe **bought** 9 games. **How many** games did Sayeed buy?

Instructional Steps

2. Students will identify the important words from a word problem. (*Tell student, we will be looking for the following mathematics words : How many, total, together, more...*)

Tell student, we will be looking for the following mathematics words : How many, total, together, more... Read the word problem and point to, highlight or emphasize target words. Have student touch, point, or somehow indicate the target words.



In order to make sense of a problem, a student must be able to identify the relevant words of the problem. During instruction, the teacher can point out the relevant mathematics words needed to determine the correct operation to use to solve a problem, and the student can match a word card to the relevant words in the problem as it is read.

Math Example

Joe and Sayeed bought a total of 20 Wii games. Joe bought 9 games. How many games did Sayeed buy?

Instructional Steps

3. Students will model a word problem using manipulatives.

Provide the student a template ($\underline{\quad} = \underline{\quad} + \underline{\quad}$) and manipulatives. Read the first sentence of the problem together. Emphasize the word “total” and the number 20. Using errorless learning strategies, have student point to 20 (pick up 20, push 20, identify 20 in some way). Place 20 in the template and count out 20 items.

Read the next sentence of the problem together. Emphasize the word “bought” and the number 8. Using errorless learning strategies, have student point to 8. Place 8 in the template and count out 8 items from the 20.

National Center and State Collaborative



In step three of this process for solving problems, students will model the word problem using manipulatives.

In order to make sense of a problem, provide the student with an equation template and manipulatives. After the first sentence of the problem has been read, and the student has identified the number in the sentence, have the student count out the total number of items and find the corresponding numeral. Place the numeral in the template. Repeat with the second sentence. The manipulatives can be used to help solve the problem, by creating matching pairs of items the first and second set of manipulatives using one to one correspondence. Count the items left without a pair, and record as the answer.

Math Example

Joe and Sayeed bought a total of 20 Wii games. Joe bought 9 games. How many games did Sayeed buy?

Instructional Steps

4. Students will choose the equation that best represents a word problem.

Count the remainder items, point to the corresponding number (12) and place the number 12 in the template.
Model the addition problem $20=8+12$



In the last step of this process for solving problems, students will identify or write the equation that represents the word problem.

The student should record the correct number in the equation template, the correct operation, and the answer, based on all the previous steps.



Let's look at some NCSC resources that might help you think about prerequisite skills that are embedded in grade specific concepts.

Learning Progressions Frameworks

The Nature of Numbers & Operations (NO) – The skills and concepts within the Nature of Numbers and Operations strands

The Nature of Numbers and Operations strands form the foundation - and often are the prerequisite skills and concepts - for many of the other mathematics strands.

Curriculum development efforts should always consider how the skills and concepts described in the Numbers & Operations progress indicators can be introduced, practiced, and extended with skills/concepts found in the other strands. The third N&O strand (p. 12) focuses on mathematical reasoning and problem solving. These progress indicators can be integrated with many CCSS standards at each grade level using problem solving contexts. While listed under the Nature of Numbers & Operations strand, the skills and concepts described in these progress indicators could apply to concepts in different mathematics strands, such as when developing proofs in Geometry. (See pages 12-13 for key learning targets for the Numbers & Operations strand.)



Learning Progression Frameworks build on skills and concepts to build more sophisticated understandings, beginning with prerequisite skills.

Instructional Families

Sorting and Classifying	Measuring Using Tools	Problem Solving Using Measurement Process	Perimeter, Area and Volume Problems	Scaling and Unit Conversions
(K-4) Elementary School Learning Targets				
E.ME-1 Explore relationships among units, attributes, and measures within a system of measurement: <ul style="list-style-type: none"> • Identify measurement attributes and units; • Use measurement attributes to describe and compare objects, situations, or events. 				
E.ME-2 Apply appropriate techniques (iteration and tiling), tools (standard and non-standard), and formulas (area and perimeter) to determine or estimate measurements.				
K	Grade 1	Grade 2	Grade 3	Grade 4
K.ME.1a1 Describe objects in terms of measurable attributes (longer, shorter, heavier, lighter...) K.MD.1	1.ME.1a2 Identify minutes and hours on a digital clock 1.MD.3 1.ME.1b3 Order up to 3 objects based on a measurable attribute (height, weight, length) 1.MD.1	2.ME.1a3 Select appropriate unit of measurement to measure an object (ruler or yard stick; inches or feet) 2.MD.1 2.ME.1a5 Tell time to the nearest ½ hour using digital clocks 1.MD.3	3.ME.2e1 Select appropriate tool for measurement: liquid volume, area, time, money 3.MD.2 3.ME.1a1 Tell time to the nearest 5 minutes using a digital clock 2.MD.7	4.ME.2e4 Select appropriate tool for measurement: mass, length, angles 4.MD.6 4.ME.2e5 Construct a given angle 4.MD.6
K.ME.1b1 Sort objects by characteristics (e.g., big/little, colors, shapes, ect.) K.MD.3	1.ME.1b4 Compare the lengths of two objects indirectly by using a third object 1.MD.1	2.ME.1c2 Measure the attributes (length, width, height) of an object using 2 different size units 2.MD.2	3.ME.1d1 Use tiling and addition to determine area 3.MD.7a	4.ME.2e6 Measure right angles using a tool (e.g., angle ruler, protractor) 4.MD.6
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) K.MD.2	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	2.ME.1c3 Recognize that units can be decomposed into smaller units 2.MD.3 2.ME.2b2 Select appropriate tools and demonstrate or identify	3.ME.1d2 Measure area of rectilinear figures by counting squares 3.MD.6 3.ME.1f1 Select appropriate units for measurement (liquid	4.ME.1d3 Use tiling and multiplication to determine area 3.MD.7a 4.ME.1f3 Select appropriate units for measurement: mass,

The Instructional Families took the concept of the learning progressions and organized the CCCs to help visualize that progression of skills from simpler to more sophisticated. Some earlier skills end up being prerequisites of a sort for later skills. So we can use the instructional families to help determine those prerequisite skills that are used demonstrating performance of the grade level concepts.

Element Card – Essential Understandings		
CCSS: K.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.		
CCC:	K.PRF.1c1	Solve one step addition and subtraction word problems, and add and subtract within 10 using objects, drawings, pictures
Strand: Patterns, Relations, and Functions	Family: Representing and Modeling Problems	
Progress Indicator: <i>E.PRF.1c modeling problem solving situations that involve addition and subtraction of whole numbers using objects, diagrams, and symbols</i>		
Essential Understandings	Concrete Understandings: <ul style="list-style-type: none"> Create an array (e.g., show me 1 group/row of 3). 	Representation: <ul style="list-style-type: none"> Select a numeral to place under each representation in a modeled equation. Select a pictorial representation of an array that matches the addition or subtraction problem. Vocabulary: add, subtract
Suggested Instructional Strategies: <ul style="list-style-type: none"> Teach explicitly how to count objects in a set and that the last number name said tells the number of counted objects <ul style="list-style-type: none"> Present a set of objects for the student to count. Rearrange the objects and ask the student how many objects there are (the student understands cardinality of numbers if s/he states the same number without recounting the objects) Teach explicitly how to create a group/row/set of objects for a given number or for a number provided in a simple word problem Multiple Exemplar Training <ul style="list-style-type: none"> An array/row. "This is a group/row of three apples. This is another group/row of three apples. This is another group/row of three apples. This is one apple. Show me a group/row of three apples." Example/Non-example <ul style="list-style-type: none"> Present a row of objects (≤ 10). Present a second row of objects that has a different number of objects. Ask the student to select the row with a specified number of objects. Present three rows of objects (≤ 10), two that are equal and one that is not equal. Ask the student to match the two rows that both include the same number of specified objects (e.g., a row of three hats, a row of three shoes). Use System of Least Prompts to form an array (group/row) given a number: <ul style="list-style-type: none"> "Make a row/group of three pencils." The student responds correctly. "Good work. You made a row/group of three pencils." OR The student doesn't respond. Wait 3-5 seconds and provide a gesture prompt by pointing to the pencils. OR The student doesn't respond. Wait 3-5 seconds and provide a verbal prompt. "Pick up three pencils. Make a group of three pencils." OR The student makes an error, provide a physical prompt. Take the student's hand and give him or her three pencils and help him or her make a row of pencils 		

Element cards can help us think about the embedded prerequisite skills and how to use those skills to help learn and demonstrate grade-specific concepts through the essential understanding and suggested instructional strategies. These pieces help us identify the prerequisites and give us some strategies on how to embed instruction within student learning.

Curriculum resource guides

6. How Do I Make Instruction on “Measurement and Geometry” Accessible to ALL the Students I Teach?

6.1 Teach Prerequisites and Basic Measurement and Geometry Skills Concurrently: Remember that students can continue to learn basic numeracy skills in the context of this grade level content.

- Basic numeracy skills that can be worked on as a part of a lesson relating to perimeter, area, volume, and surface area:
- identify the figures: circle, rectangle, or triangle; then find the area, circumference or perimeter
- classify figures as 2- or 3-dimensional
- identify numbers while working with them in context of measurement and geometry
- identify the number of sides or faces of 2-D and 3-D figures
- count tiles, cubes, lines, and other units of measure
- learn to match numbers and symbols ($=$, $+$, $*$) to put an equation into a calculator while computing measurement and geometry equations



Curriculum resource guides also provide some ideas on how to use prerequisite skills in a systematic process to demonstrate more sophisticated math concepts. Or where prerequisite skills can be taught and practices within instruction on more sophisticated concepts.

ccspartners.org/mediawiki/index.php/High Measurement and Ge... x MASSI

High Measurement and Geometry MASSI

MASSI: Math Activities with Scripted Systematic Instruction

Activity: Preparing a Picture to Give as a Gift		
Grade Band: High School Concept: Measurement/Geometry		
Common Core State Standard	Core Content Connectors	MASSI OBJECTIVES
HSA-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	HS.H.ME.1b2 Solve a linear equation to find a missing attribute given the area, surface area, or volume and the other attribute	<ul style="list-style-type: none"> * Calculate to find a missing attribute when given area • Calculate to find a missing attribute when given volume

Be sure to provide specific practice to students on the skills that correspond to their grade level.

Combined materials provided: finished examples of pictures in frames, picture frames of multiple sizes, boxes of multiple sizes

Teacher materials: pictures, ruler, calculator, laminated equation for area and volume

Student materials (need one set for each student): Calculators, pictures (pre-labeled with length and height), box (pre-labeled with length, height, and volume, but NOT width) Worksheets: There is a worksheet for taking data during the lesson; Skills Test

TEACHING OVERVIEW: The first section of the MASSI script introduces calculating area and volume as a prerequisite to the grade aligned component. If you are using the HS grade aligned component is then introduced, calculating to find a missing attribute given area


Prerequisite skills might include:
 number recognition, one to one correspondence, addition, multiplication

SCRIPT FOR LESSON

BUILD ESSENTIAL UNDERSTANDING: CONCEPT AND SYMBOLS: Perimeter, Area, Length, Width, Height, and Volume (Skip this section for students who understand these relationships and can identify these concepts)

INTRODUCE ACTIVITY: Today we are going to learn about packing up a picture as a present for (insert friend/family name here). Look, here's a picture that I want to send as a present to (insert name of friend/relative/etc.). Show students a picture in a picture frame. First, let's all get our pictures that we want to send as a gift. Parents can send in pictures/digital pictures, students can use their school photos, or if those are unavailable, students can print a favorite picture from the internet or clip from a magazine. Make sure each student has a picture. Pictures should be sized in appropriate sizes to fit in common picture frames (4x6) (5x7) (8.5x11). We also need a box to send our pictures. Give each student a box that could be used to ship the picture.

INTRODUCE THE PROBLEM: Before we get started finding out what size picture frame we need, we need to review some vocabulary.



MASSIs can be used to build background knowledge and practice prerequisite skills as a tiered intervention.

Instructional Resource Guides

The purpose of the Instructional Resource Guide:

- To provide guidance for teachers regarding evidence-based prompting and instructional strategies to be used to teach students with significant disabilities
- To serve as a companion document to the MASSIs (Math Activities with Scripted Systematic Instruction) and LASSIs (Language Arts Scripted Systematic Instruction)
- To help educators build knowledge of the essential systematic instructional methods and prompting strategies that are used in the MASSIs and LASSIs to teach students targeted skills



National Center and State Collaborative



The Instructional resource guides provides ideas on systematic instructional strategies that can be used incorporate errorless learning techniques when teaching, not only the grade specific concepts, but also to reinforce prerequisite skills.

Goals & Outcomes

- Define prerequisite skills
- Examine how prerequisite skills are embedded within instruction on grade level
- Gain useful tips on how to blend instruction on grade-specific skills and concepts while also working on prerequisite skills



In this webinar, did we

Define foundational skills, so that we are all on the same page when we use that term

Examine how foundational skills are embedded within instruction on grade-specific skills and concepts

And provide tips and resources on how to teach grade-specific skills and concepts while also working on foundational skills

Think about something from this webinar you can immediately try when planning instruction in your classroom or to support teachers in designing instruction.



Thank You.