Multi-Tiered System of Supports in Mathematics Course Enhancement Module

Part 1: Introduction

Facilitator's Guide

2014

Contents

Page

Introduction to the Multi-Tiered System of Supports in Mathematics Course Enhancement Module 2

- Purpose 2
- Audience 2
- Facilitator's Guide 3
- Evidence-Based Materials 3
- Tiered Organization 3
- Opportunity to Learn 5
- Interactive Adult Learning 5
- Resources 5
- Materials 6
- In This Guide 6
- Table of Contents 6
- Handouts 6
- Citation for This CEM 6

Part 1: Slides and Supporting Facilitator Notes and Text 7

Anchor Presentation Table of Contents and Handouts 36

This facilitator's guide is intended for use with the following resources:

- Presentation slides
- Participant handouts

These resources are available on the Course Enhancement Modules (CEM) web page of the CEEDAR Center website (ceedar.org).

Introduction to the Multi-Tiered System of Supports in Mathematics Course Enhancement Module

The Collaboration for Effective Educator Development, Accountability, and Reform (CEEDAR) Center developed this Course Enhancement Module (CEM) on Multi-Tiered System of Supports (MTSS) in mathematics to assist faculty at institutions of higher education (IHEs) and professional development (PD) providers in the training and development of all educators. This CEM provides information and resources about how to prepare teacher and leader candidates and current practitioners to create effective instructional environments for all students, including students with disabilities and their non-disabled classmates. This module helps educators appreciate that an effective instructional environment integrates a continuum of academic and behavioral interventions that are evidence based and accommodate the needs of each student in the class and school.

Through this CEM, participants will learn about assessment tools and intervention practices that should be integrated into a comprehensive, evidence-based math intervention program within the Response to Intervention (RtI) framework. MTSS integrates assessment and intervention within a school-wide, multi-level prevention system to maximize student achievement and reduce behavior problems. The assessment tools and intervention practices are research-based and involve multiple levels of support (including school-wide, class-wide, small-group and individual levels of support) using data-based decision making. As participants gain knowledge about how to effectively use these tools and practices, they will become proficient in using mathematics data to guide intervention decisions, matching the academic intervention to the specific skill deficit and the intensity of a student's needs. The CEM will guide participants in becoming proactive, positive problem solvers who anticipate student needs and design instruction and interventions to prevent academic failure.

Purpose

This CEM was designed to build the knowledge and capacity of educators in the selected topic. The module may be adapted and is flexible to accommodate faculty and PD provider needs. The anchor presentation and speaker notes may be used in their entirety to cover multiple course or professional PD sessions. Alternatively, specific content, activities, and handouts may be used individually to enhance existing course and PD content.

Audience

The audience is intended to be teacher and leader candidates within pre-service programs at the undergraduate or graduate levels, district teachers, practitioners, and leaders participating

in in-service professional learning opportunities. The CEM could also be used for PD for current teachers, practitioners, and leaders interested in staying abreast of current research and trends on best practices for students with disabilities and students who struggle. The facilitator's guide serves as a blueprint to support faculty and PD providers charged with providing teachers and leaders with training in a selected topic. Faculty members and state and local PD providers can conduct the training.

Facilitator's Guide

The facilitator's guide consists of anchor presentation slides with a script to support facilitators as they present the content and learning activities within the presentation. Facilitator notes and talking points are included. The speaker notes are intended as a guide for facilitators using the PowerPoint slides and may be modified as needed. Reviewing the entire guide prior to facilitating the training is highly recommended.

Evidence-Based Materials

All information and resources included in this presentation were drawn from PD products developed by U.S. Department of Education–sponsored centers and projects and other peer-reviewed, research-based, or reputable sources. These centers and projects used a rigorous process to directly link their PD products to available research evidence on MTSS in mathematics. For example, the National Center on Intensive Intervention (www.intensiveintervention.org) follows a five-step process for product development (i.e., design, production, internal review, external review, and U.S. Office of Special Education Programs approval) to develop its series of eight training modules about how to use a data-based-individualization approach to design and implement intensive academic and behavioral interventions for students with severe, persistent needs.

Tiered Organization

The learning resources are organized into four main parts:

Part 1: Introduction. Part 1 introduces participants to the essential elements of mathematics content and instructional practices that all teachers need to know in order for students to gain proficiency. The importance of science, technology, engineering, and mathematics (STEM) education is defined in terms of college and career readiness, meeting the needs of the future job market, and eliminating historical disparities in math and science education. Part 1 also describes the characteristics of students who have math disabilities, outcomes for students who struggle with math, and real-life application through case studies.

Part 2: Universal Math Instruction. Part 2 introduces participants to the concept of universal math interventions—supports for all students, including students with disabilities and English language learners (ELLs)—in the context of MTSS and instruction in the Common Core State Standards (CCSS). Instruction at the universal level should include high-quality instructional practices that are evidence based and delivered with fidelity in recognition of student strengths. Part 2 also describes the role of screening and progress monitoring at the universal level to determine whether the core curriculum instruction is effective for most students.

Part 3: Supplemental Math Interventions. Part 3 introduces participants to the process and importance of implementing supplemental interventions and using data to determine whether a particular intervention is working to improve outcomes for at-risk students in mathematics. It includes descriptions of the distinguishing features of supplemental interventions and considerations for selecting and implementing evidence-based math interventions to effectively address student skill deficits in mathematics. Part 3 also explains how to apply progress-monitoring strategies in the data-based decision-making process to determine whether the student is responding to the supplemental intervention prior to intensifying the instruction.

Part 4: Intensive Math Interventions. Part 4 introduces participants to using data-based individualization (DBI) as a framework for increasing the intensity of math interventions to accommodate the individual needs of non-responding students. It identifies strategies for intensifying mathematics instruction to adequately address a student's severe and persistent learning needs. Part 4 explains how to use more frequent and precise progress monitoring to determine whether a student is making adequate gains in mathematics with specially designed instruction.

As illustrated in Figure 1, the parts of this CEM are framed according to level of intensity. A complete table of contents and summary of handouts for each part is included at the end of this guide.

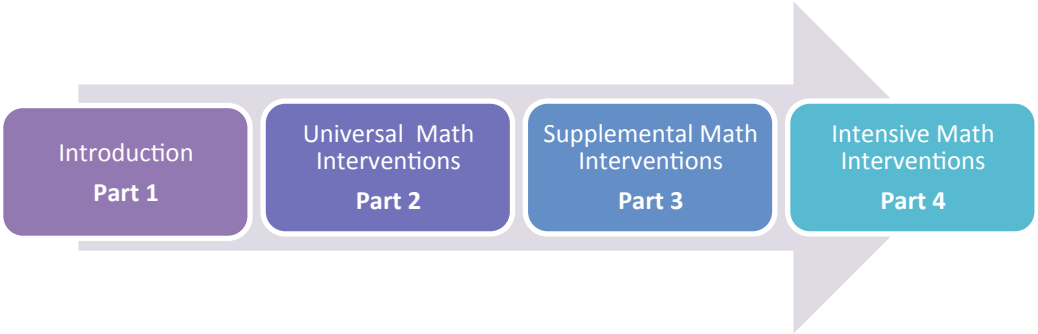


Figure 1. Multi-Tiered System of Supports in Mathematics Anchor Presentation Structure

Opportunity to Learn

Learning activities are embedded throughout each part of the anchor presentation. Each part concludes with an evolving case study in which facilitators and participants can discuss and apply the acquired knowledge of MTSS in mathematics to make data-based instructional decisions for a hypothetical student. All parts engage participants in a variety of interactive learning activities such as videos, small and whole group discussions, reflections, and handouts. Parts 2 and 3 explore interactive online tool charts that can be used to inform the selection and implementation of research-based mathematics assessment and intervention tools. Parts 2 and 4 provide concrete examples of explicit, high-quality mathematics instruction that can be applied to immediate teaching experiences. Part 3 engages students in data analysis activities that allow participants to practice graphing, calculating slope, and using slope to determine responsiveness to math interventions. All activities are optional and may be adapted to meet the needs of a particular audience.

Interactive Adult Learning

This CEM consists of interactive adult learning activities so that participants can engage with and unpack content with their peers through engaged learning. These are also activities participants can use in their own classrooms with students. Directions for each activity are provided in the section where it appears.

Resources

The following resources are provided for use in delivering the anchor presentation:

- Facilitator's guide (this document)
- Presentations
- Participant handouts, as needed
- References and slide citation charts, as needed

All of these materials may be used and adapted to fit the needs of the training context. To cite the content, please use the following statement: "These materials have been adapted in whole or in part with permission from the CEEDAR Center." The citation should be: Artzi, L., Jackson, D., & Marshall, A. (2014). *Course Enhancement Module*: *Multi-tiered systems of supports in mathematics.* Gainesville, FL: The CEEDAR Center. Retrieved from http://www.ceedar.org

Materials

The following materials are recommended for training and associated activities:

- Chart paper
- Markers for chart paper
- Scissors
- Post-it notes
- Timer
- Pens at each table
- Internet connection for website links embedded in presentations
- Calculator

Necessary materials will vary based on the content and activities selected, which will depend on the audience and the format of the course or PD session.

In This Guide

The remainder of the guide provides speaker's notes to support facilitators as they present the content and learning activities included in this anchor presentation. Reviewing the entire guide prior to facilitating the training is highly recommended.

Table of Contents

- Why Is Mathematics Education So Important?
- Characteristics of Successful Math Programs, Teachers, and Students
- How Mathematical Thinking Develops
- Multi-Tiered System of Supports

Handouts

- Handout 1: A Guide to 8 Mathematical Practice Standards
- Handout 2: Creating Baselines and Goal Lines
- Handout 3: Concrete-to-Representational-to-Abstract (C-R-A) Instruction

Citation for This CEM

Permission for use is not required, but please cite as:
Artzi, L., Jackson, D., & Marshall, A. (2014). *Course Enhancement Module*: *Multi-tiered systems of supports in mathematics.* Gainesville, FL: The CEEDAR Center. Retrieved from http://www.ceedar.org

Part 1: Slides and Supporting Facilitator Notes and Text

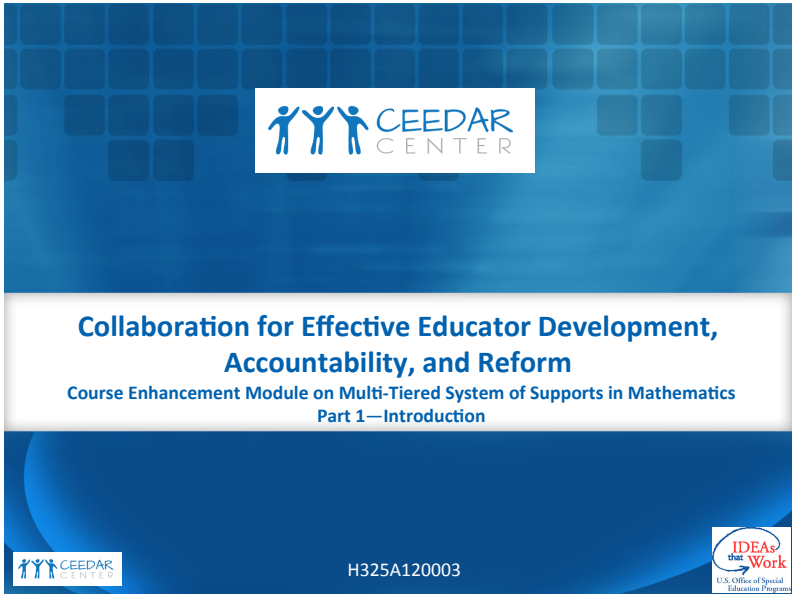
Slide 1—CEM on Multi-Tiered System of Supports in Mathematics: Part 1 (Introduction)

An overview of the Course Enhancement Module (CEM) on evidence-based math interventions is provided.

Intent for use is discussed.

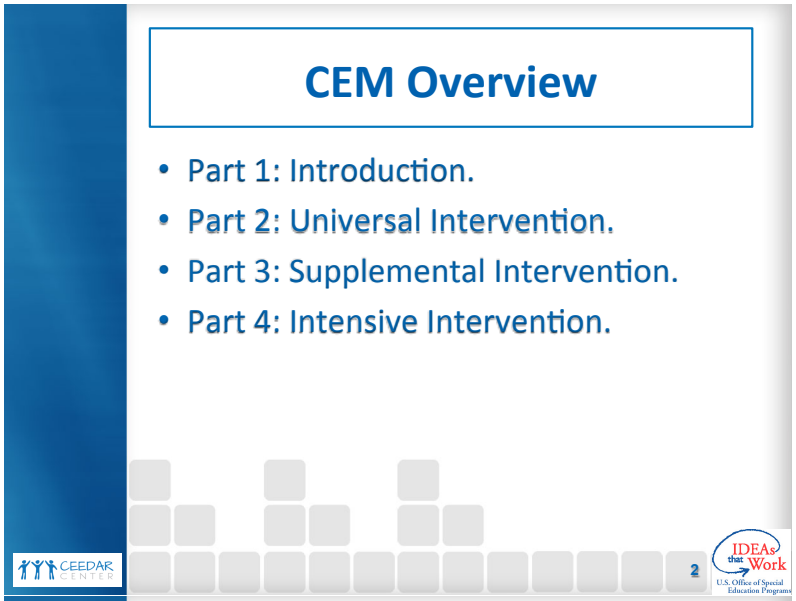
This CEM describes math interventions that are informed by research and that provide multiple levels of support.

Speaker notes are provided for most of the PowerPoint slides included in each of the five parts of this CEM.



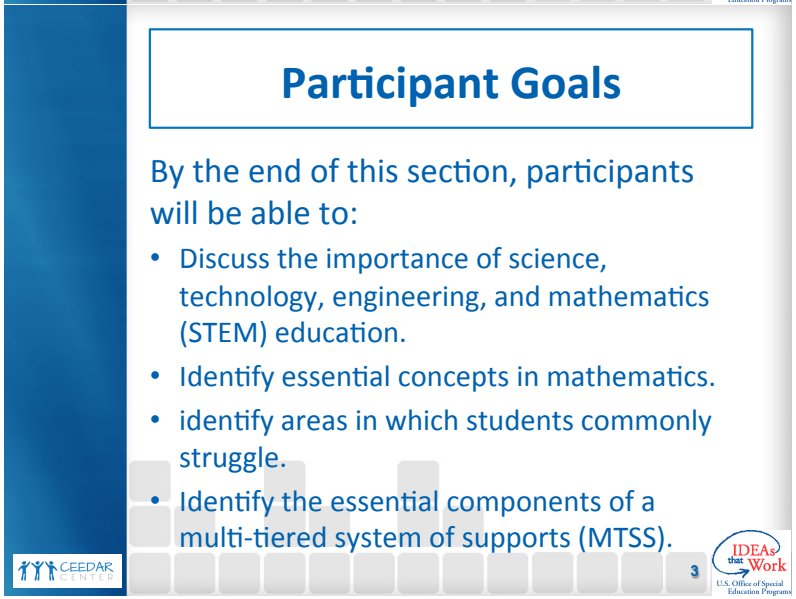
Slide 2—CEM Overview

The CEM has four interrelated parts.



Slide 3—Participant Goals

Goals of the CEM Part 1



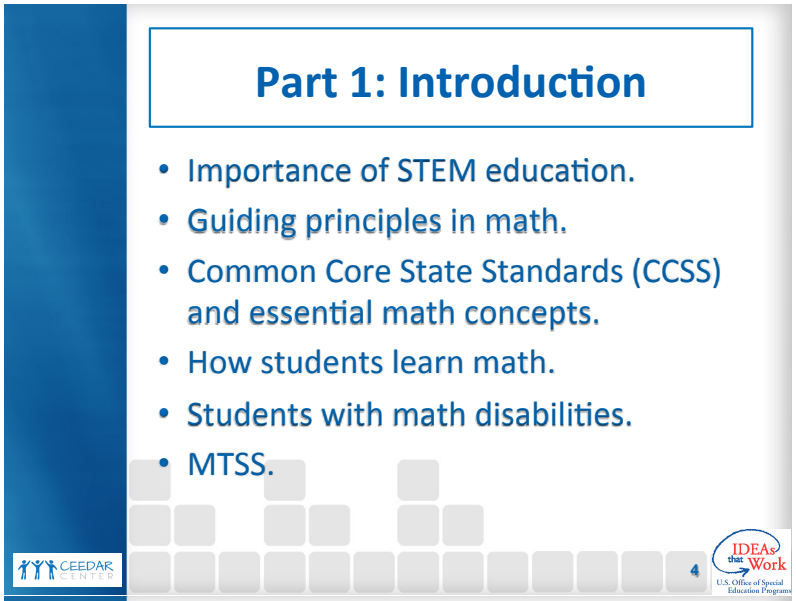
Slide 4—Part 1: Introduction

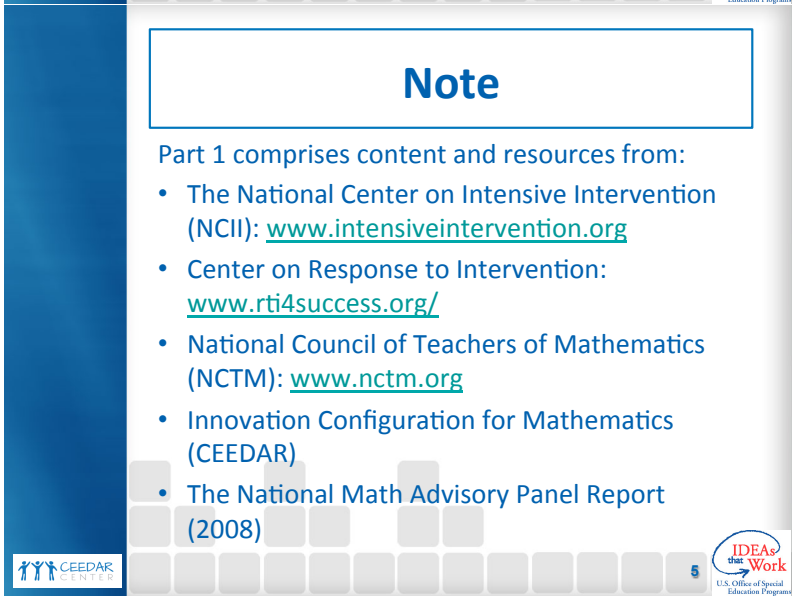
Part 1 of this CEM

- addresses the importance of STEM education and math proficiency;
- introduces participants to the math content areas and math practices that all students need to know and demonstrate in order to gain proficiency; and
- describes the characteristics of students who have math disabilities, outcomes for students who struggle with math, and real-life case studies.

Slide 5—Note

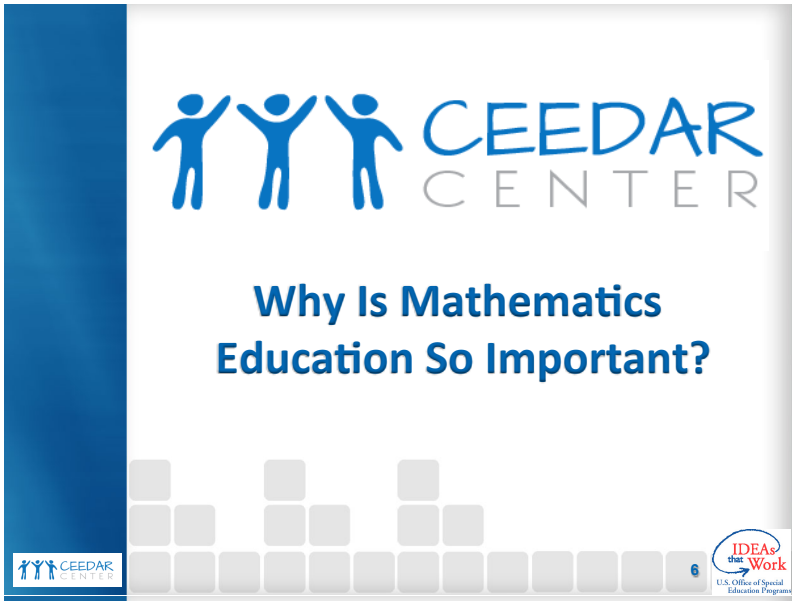
Slides and other resources have been adapted from materials provided on these centers' websites. Throughout the CEM, we will highlight internet resources for specific topics. For additional information, see the references and resources lists on the CEM website.





Slide 6—Why Is Mathematics Education So Important?

In this section, we will discuss the importance of STEM education and how the STEM movement originated.

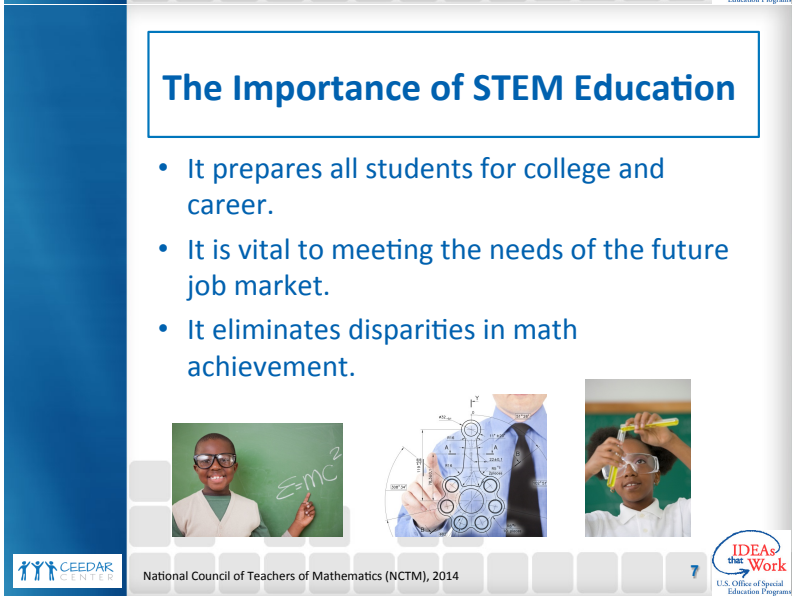


Slide 7—The Importance of STEM Education

Explain that science, technology, engineering, and mathematics education is important in the 21st century for many reasons:

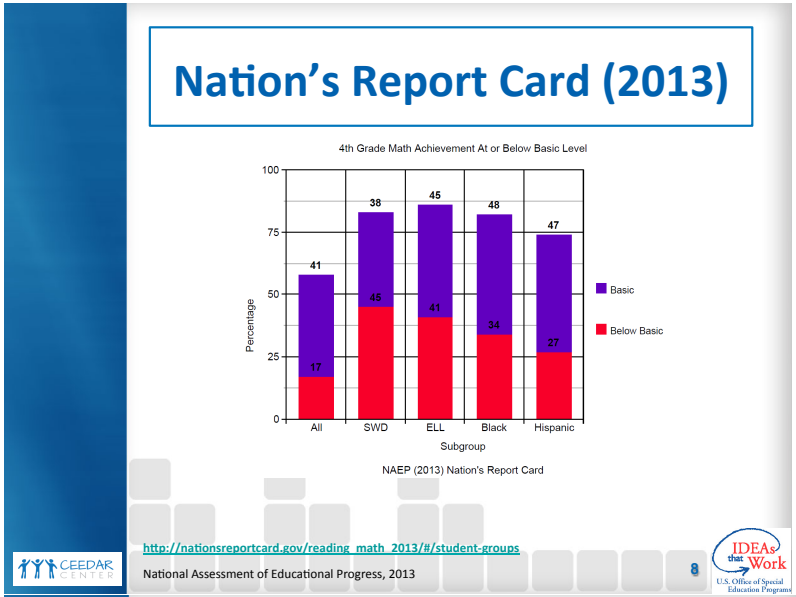
- *It prepares students for college and career.*
- *It is vital to meeting the needs of the future job market.*
- *It eliminates historical disparities in math and science education.*

For more information see:
http://www.nctm.org/about/content.aspx?id=6350



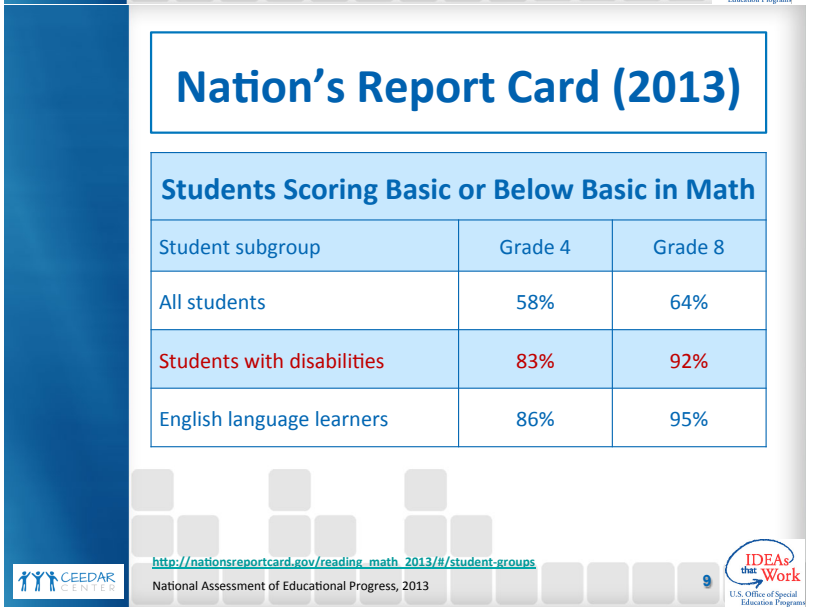
Slide 8—Nation's Report Card (2013)

This graph shows the percentage of students scoring at the basic and below-basic levels by subgroup in Grade 4, highlighting the disparities in math achievement by subgroup.



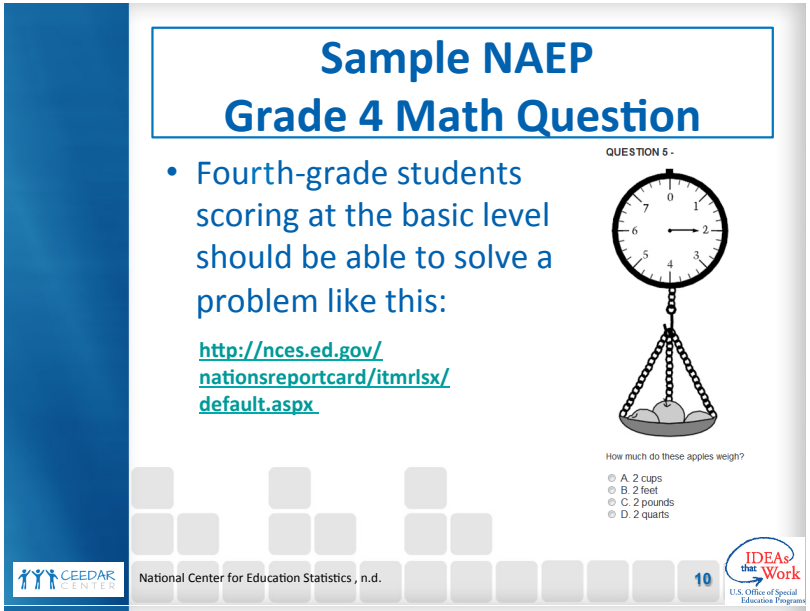
Slide 9—Nation's Report Card (2013)

These scores indicate that the majority of students with disabilities are not scoring within the proficient range in Grade 4, and the numbers become even worse as these students matriculate through school (i.e., Grade 8).



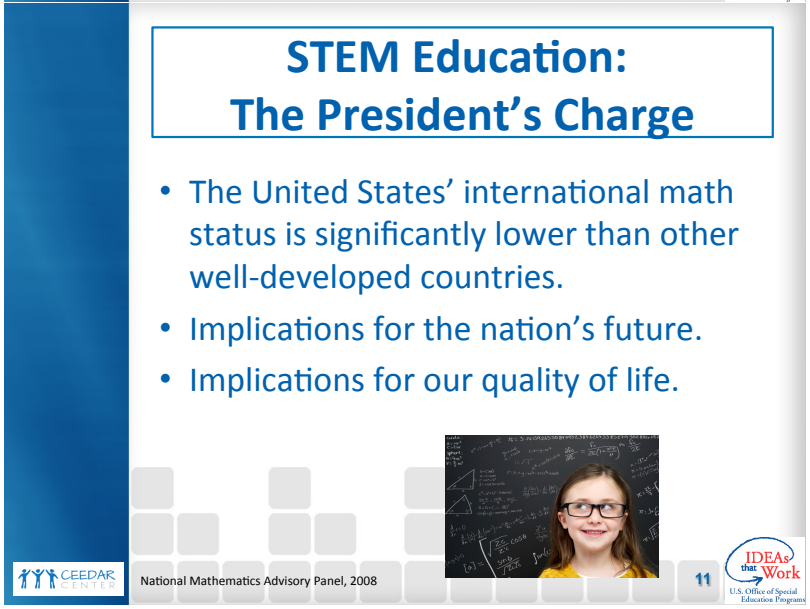
Slide 10—Sample NAEP Grade 4 Math Question

Discuss this example of a question for a student scoring at the basic level.



Slide 11—STEM Education: The President's Charge

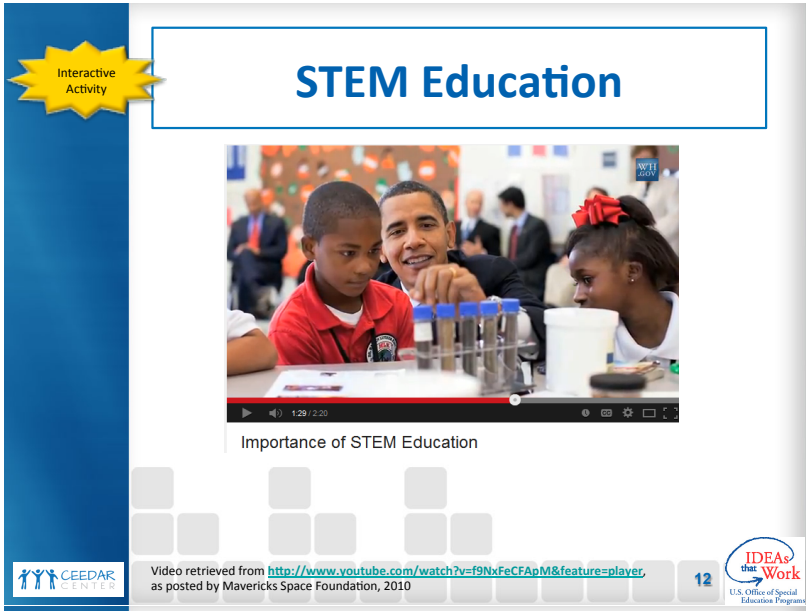
The president's charge (NMAP, 2008).



Slide 12—STEM Education

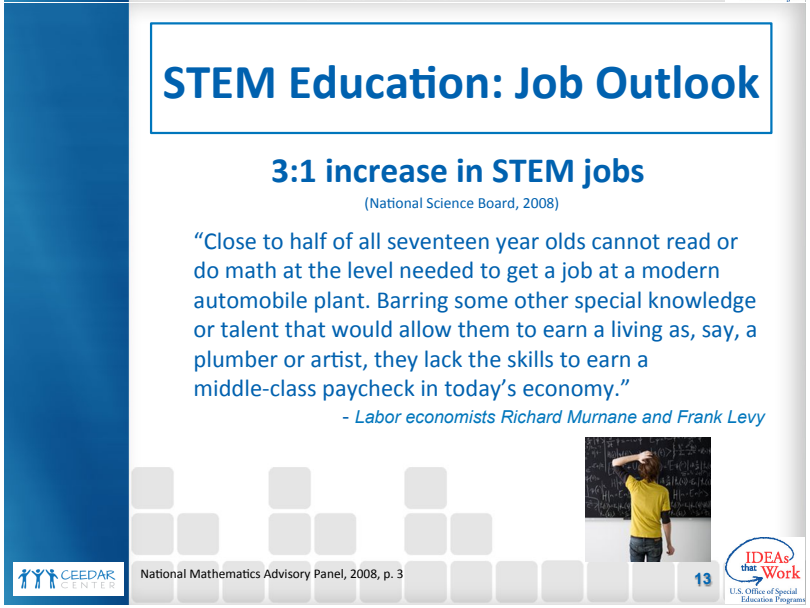
Listen to this clip that details the White House emphasis on STEM education:

http://www.youtube.com/watch?v=f9NxFeCFApM&feature=player_detail page



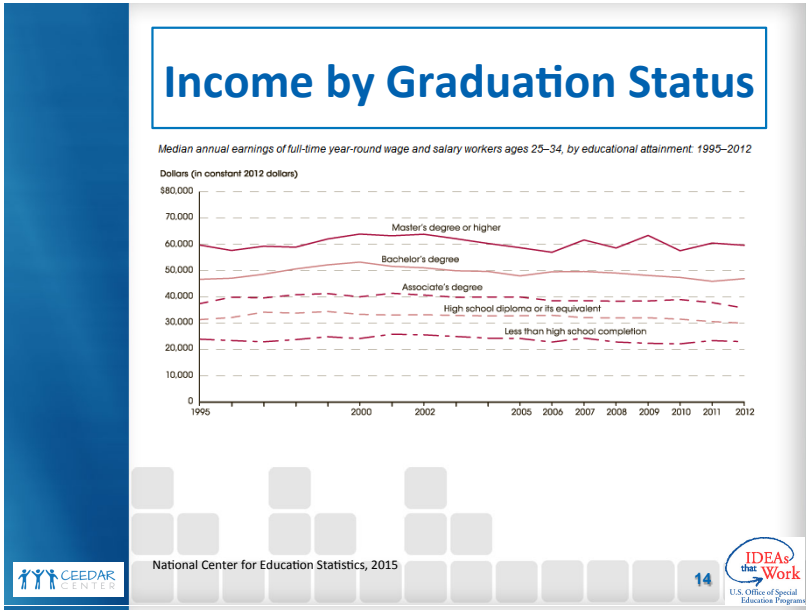
Slide 13—STEM Education: Job Outlook

Growth rates in employment in the science and engineering occupations.



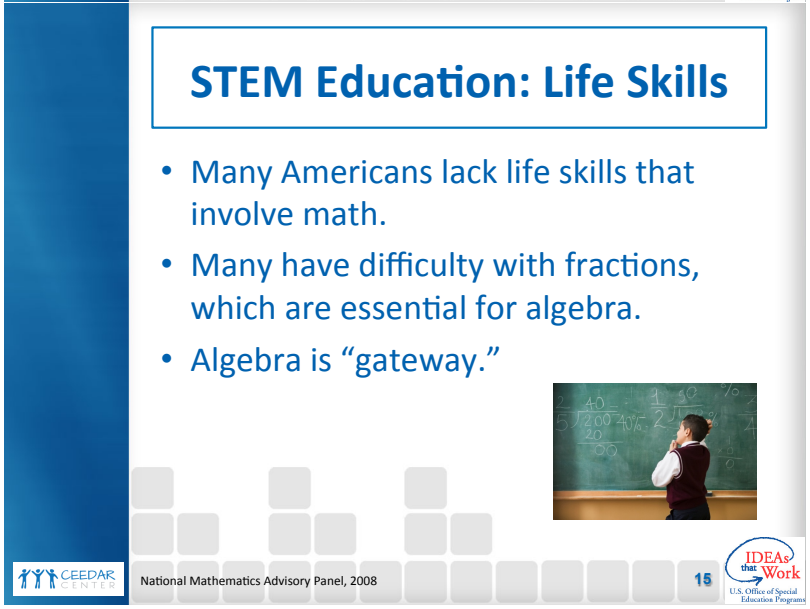
Slide 14—Income by Graduation Status

Educational attainment is directly related to an individual's income.



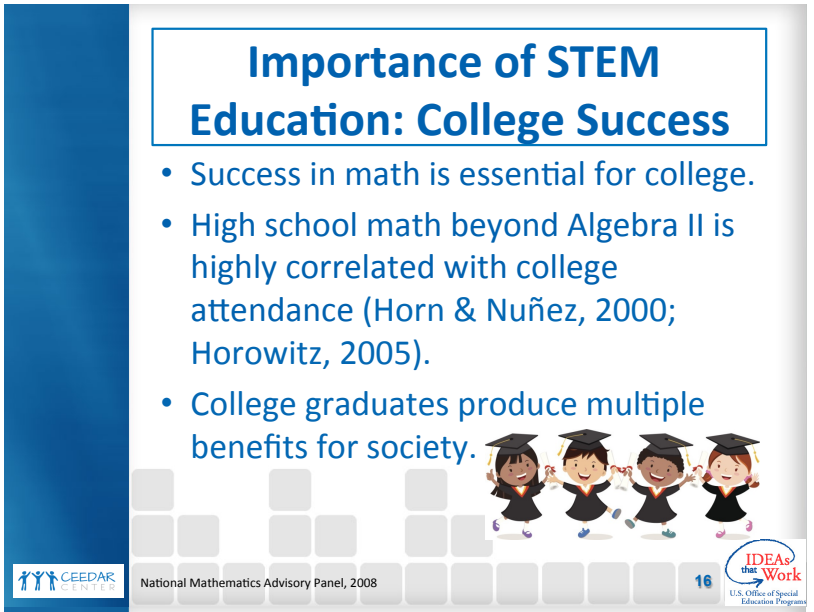
Slide 15—STEM Education: Life Skills

The importance of mathematics literacy as a life skill.



Slide 16—Importance of STEM Education: College Success

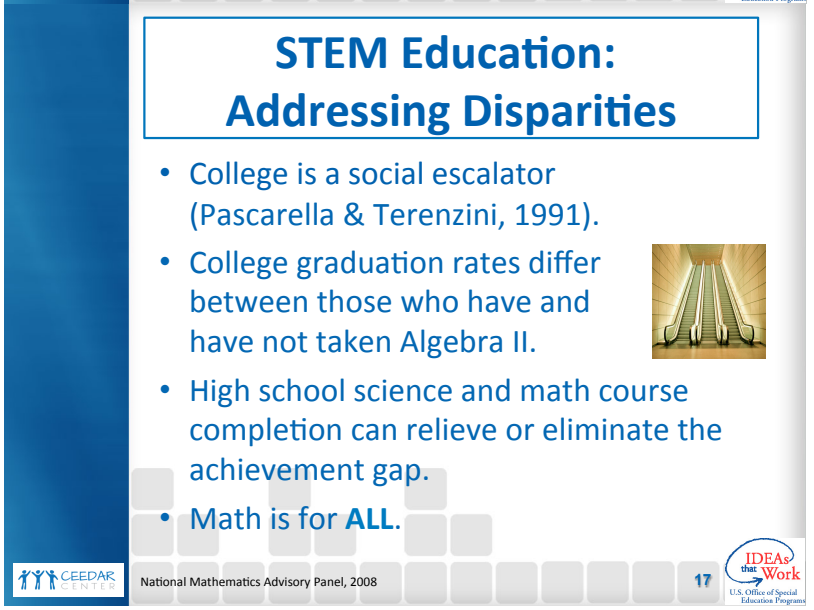
Success in mathematics education matters because it increases students' options for college and career, as well as their prospects for future income.



Slide 17—STEM Education: Addressing Disparities

Math for ALL:

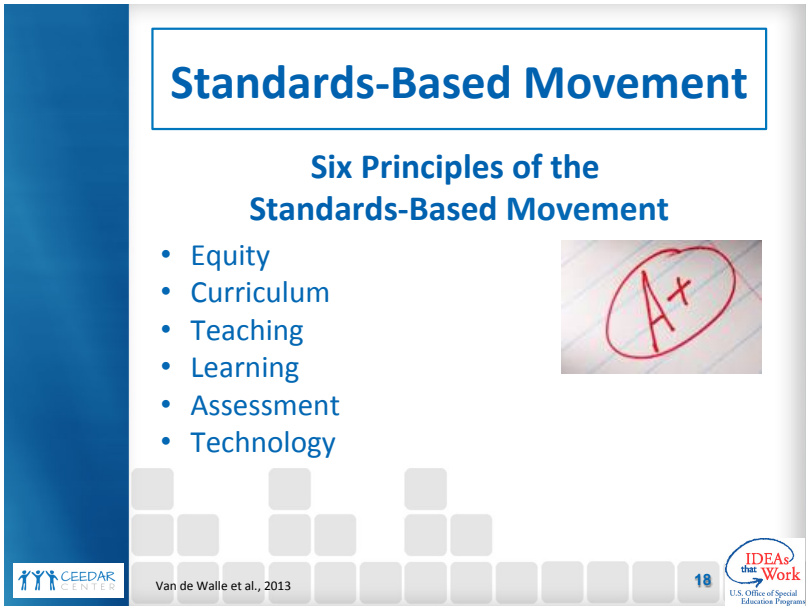
We can no longer accept that a rigorous mathematics education is reserved for the few who will go on to be engineers or scientists. High-quality mathematics education is a way to address economic and social disparities in America.



Slide 18—Standards-Based Movement

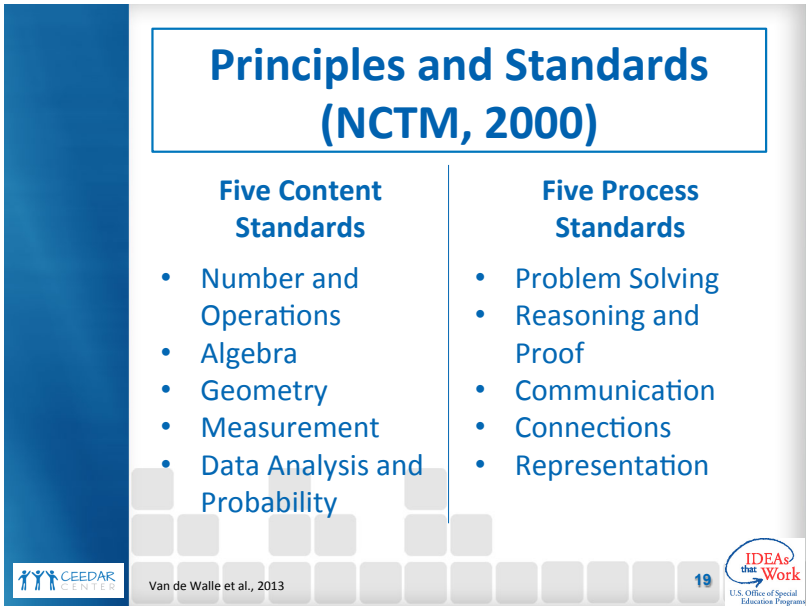
The Principles and Standards for School Mathematics (NCTM, 2000, as cited in Van de Walle et al., 2013) provides guidance and direction for teachers and other leaders in K–12 math education. The six principles fundamental to high-quality math instruction are as follows:

- Equity
- Curriculum
- Teaching
- Learning
- Assessment
- Technology



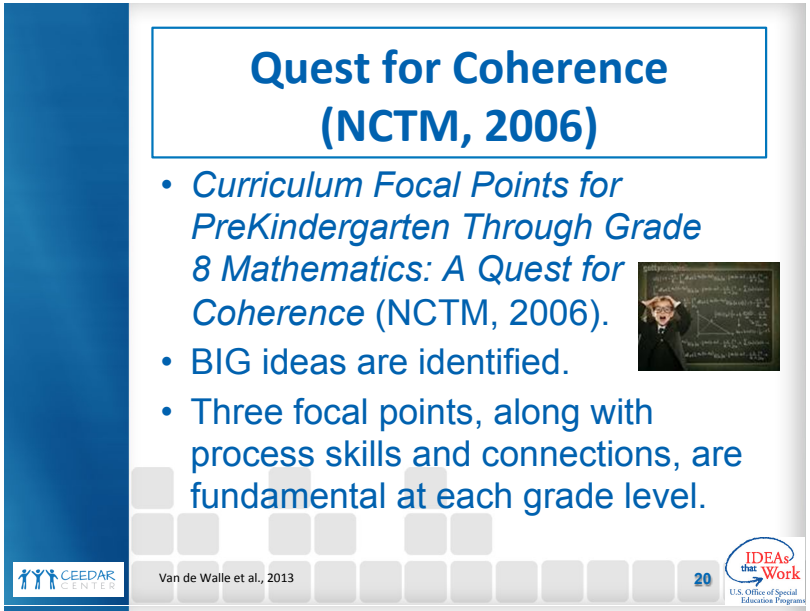
Slide 19—Principles and Standards (NCTM, 2000)

Content and Process Standards: The National Council of Teachers of Mathematics (NCTM, 2000, as cited in Van de Walle et al., 2013) developed principles and standards that all students should know and be able to meet in Grades K–12.



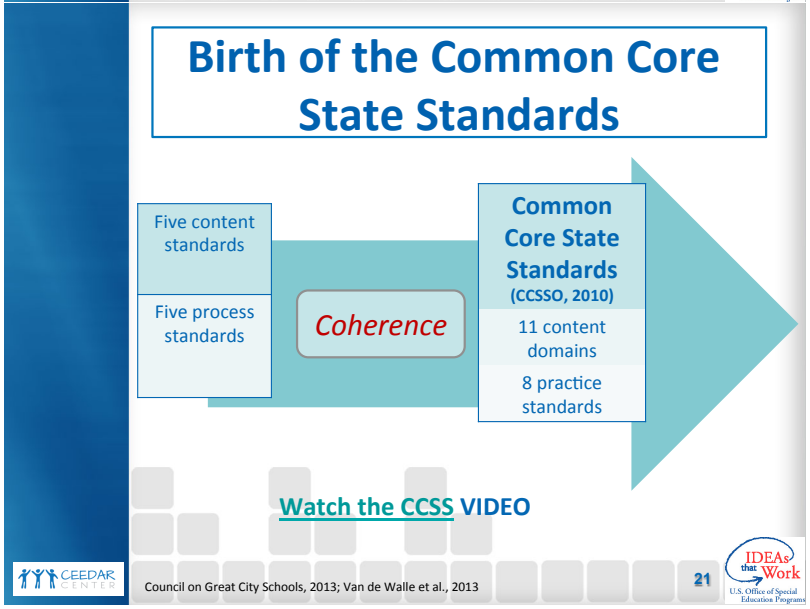
Slide 20—Quest for Coherence (NCTM, 2006)

NCTM's (2006) *Curriculum Focal Points for Prekindergarten Through Grade 8 Mathematics: A Quest for Coherence* (as cited in Van de Walle et al., 2013) pinpoints big ideas in math that should be targeted at each grade level.



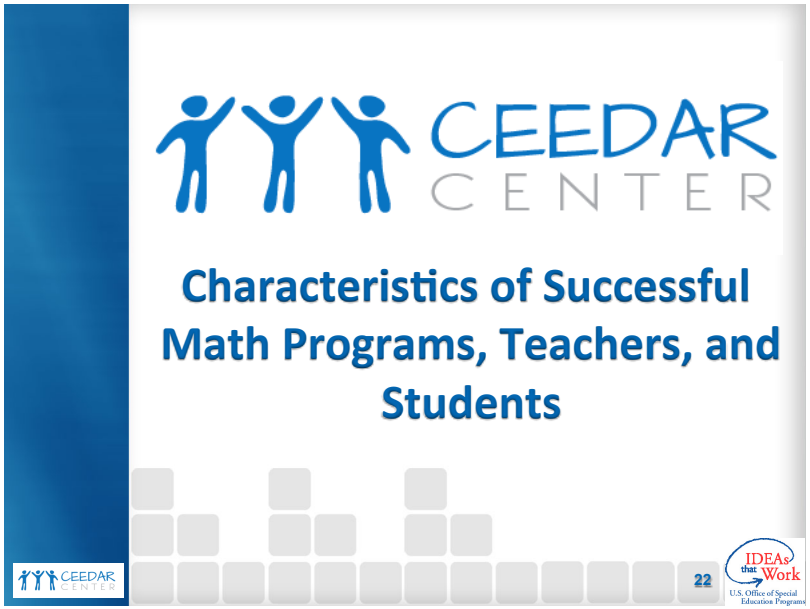
Slide 21—Birth of the Common Core State Standards

In an effort to improve mathematics teaching and learning, policy makers researched ways to prepare students to be college and career ready. The Common Core State Standards (CCSS) were developed as a result of collaboration between many state policy makers and professional groups. The CCSS articulate an overview of what all students should learn in Grades K–8, with an emphasis on the big ideas (referred to as domains). The CCSS also specify processes and proficiencies that teachers need to develop in students at each grade level.



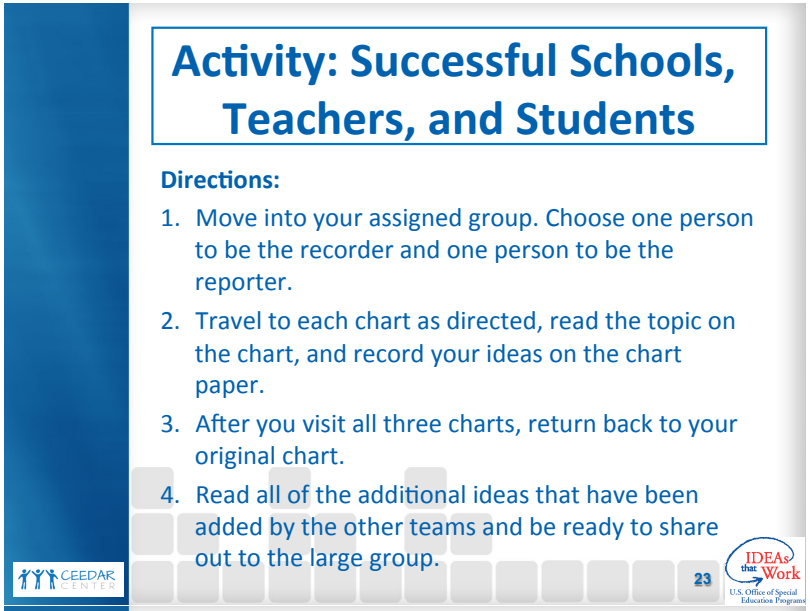
Slide 22—Characteristics of Successful Math Programs, Teachers, and Students

In this section, we will discuss the factors that contribute to student success and will examine practices at the school and teacher level.



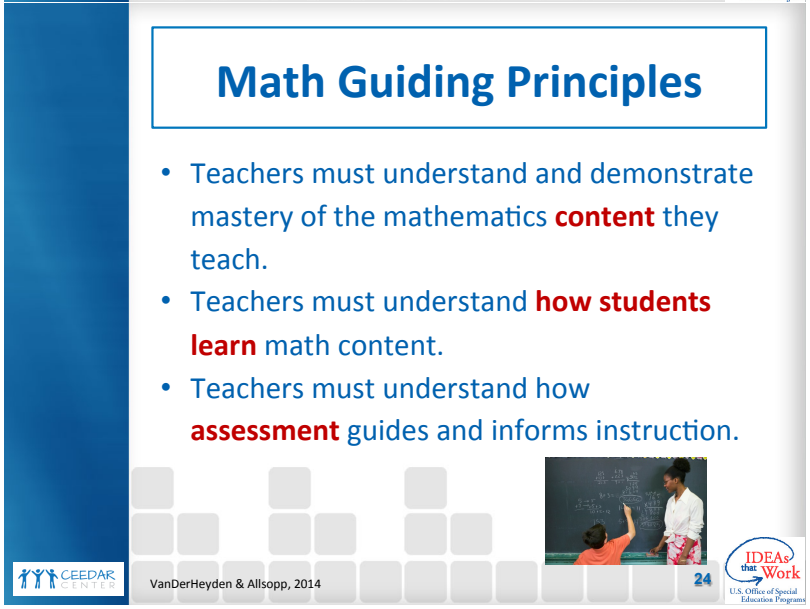
Slide 23—Activity: Successful Schools, Teachers, and Students

*Purpose of the activity: Participants will demonstrate their knowledge of the characteristics that make math programs/curriculum, math teachers, and math students successful. This will serve as a point of engagement and discussion, and it will introduce participants to the important points included in this presentation. *We will revisit this at the end of the presentation!**



Slide 24—Math Guiding Principles

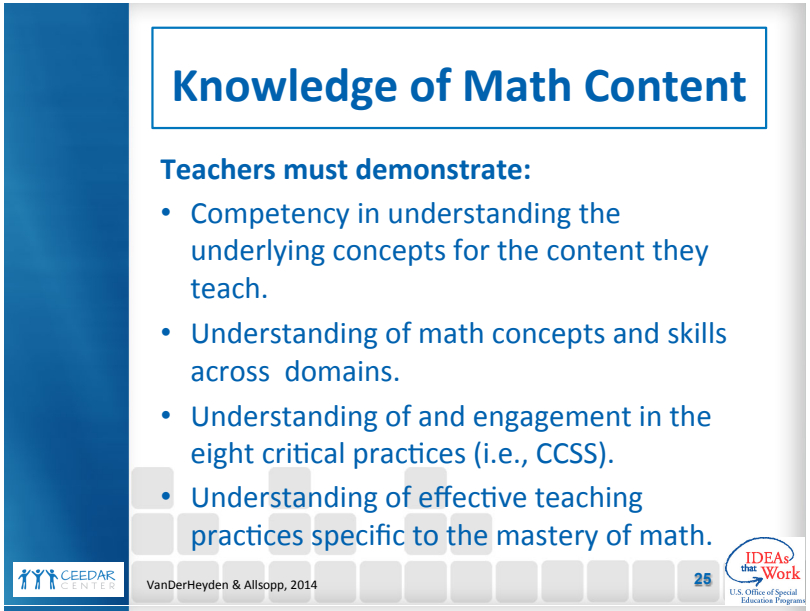
The innovation configuration (www.ceedar.org) for this module is based on three guiding principles.



Slide 25—Knowledge of Math Content

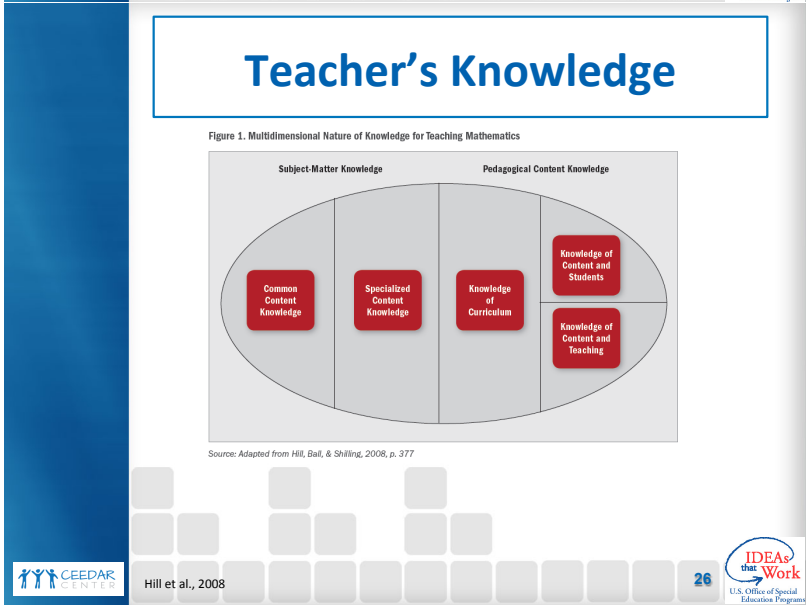
Knowledge of Math Content: What Teachers Need to Know and Do

This describes the eight critical practices emphasized by the CCSS and the 11 domains of math that teachers need to deeply understand in order to teach math



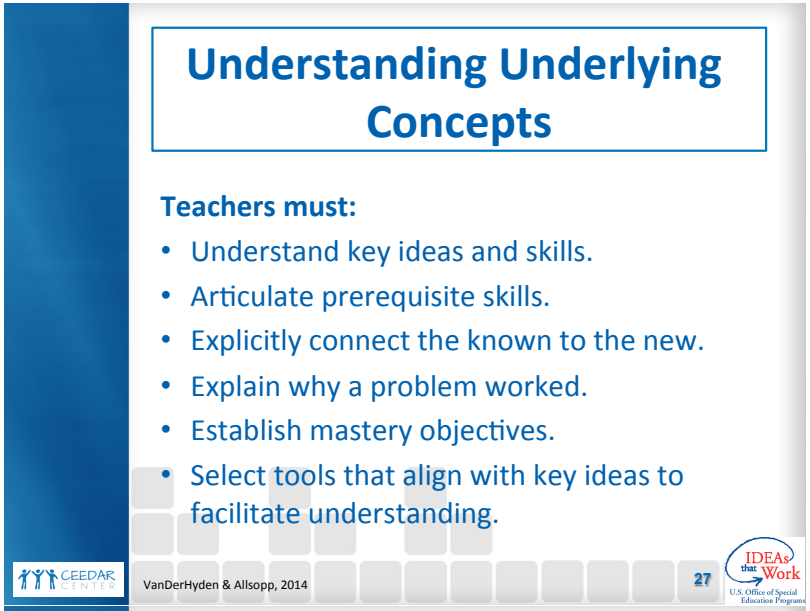
Slide 26—Teacher's Knowledge

This graph depicts the different facets of knowledge that math teachers need in order to effectively teach mathematics.



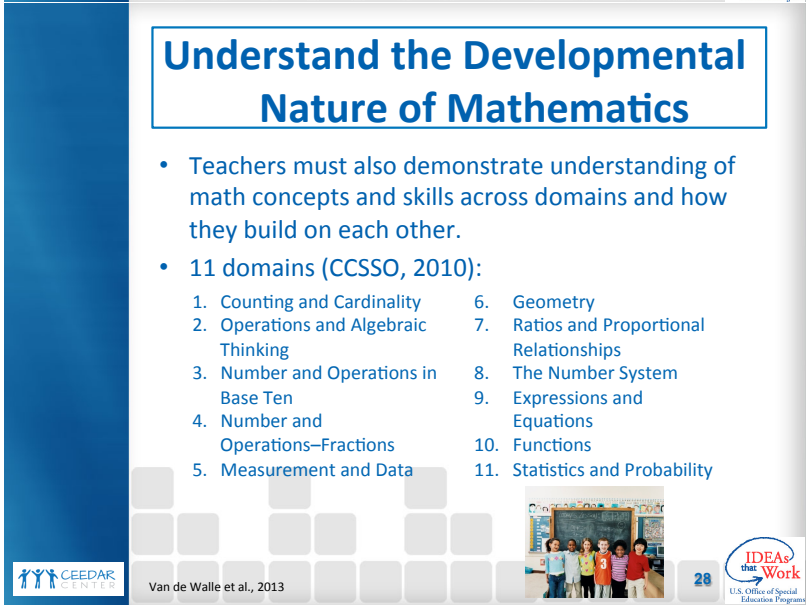
Slide 27—Understanding Underlying Concepts

Teachers must have an understanding of the mathematics content they are expected to teach.



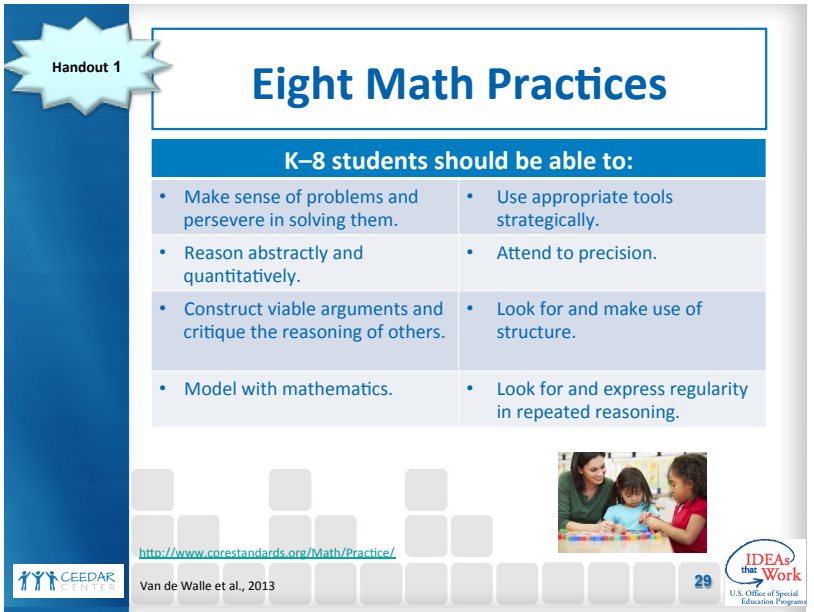
Slide 28—Understand the Developmental Nature of Mathematics

These are the 11 content domains addressed in the CCSS. They span across all grade levels i.e., (K-12) but are weighted differently in certain grades.



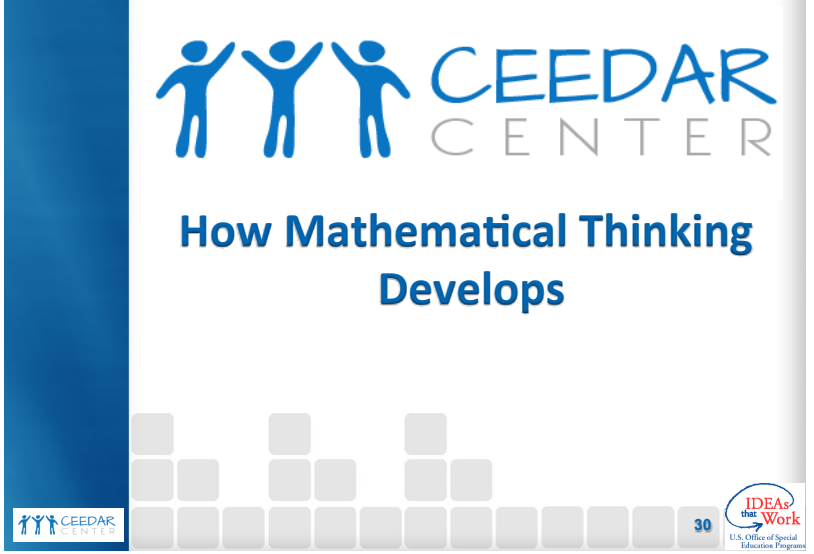
Slide 29—Eight Math Practices

These are the eight math practices that math teachers should develop in their students.



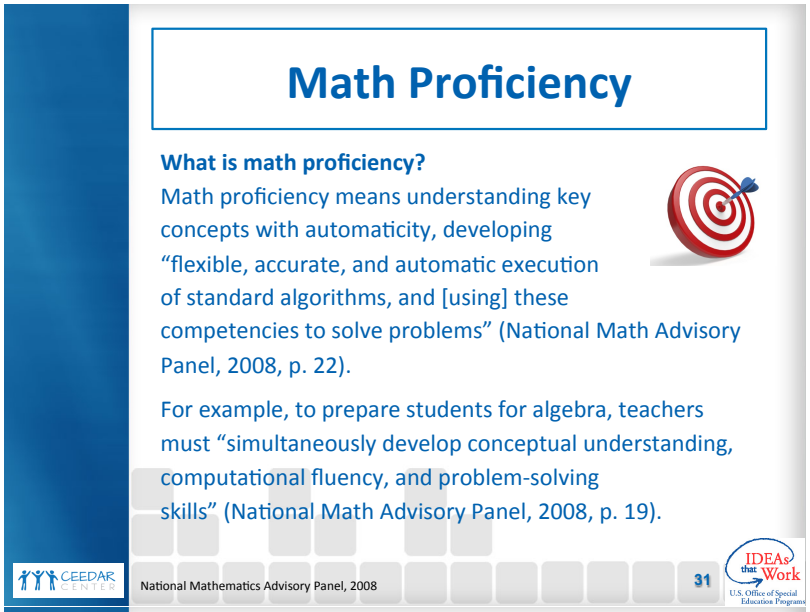
Slide 30—How Mathematical Thinking Develops

In this section, we will discuss how students build and develop mathematical skills. We will discuss the importance of prerequisite skills and how the Common Core is organized to support students' mathematical skill development.



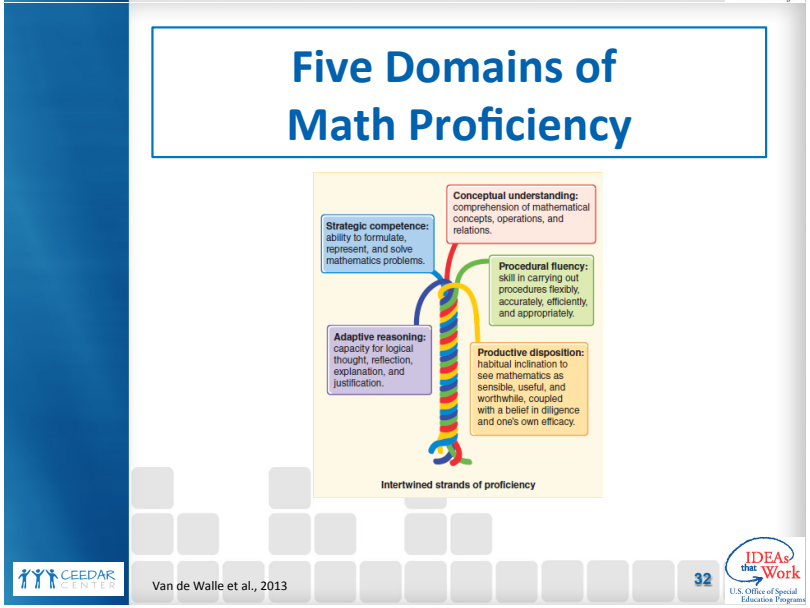
Slide 31—Math Proficiency

The goal is for ALL students to be proficient in fundamental mathematical concepts and practices at their grade level (National Math Advisory Panel, 2008).



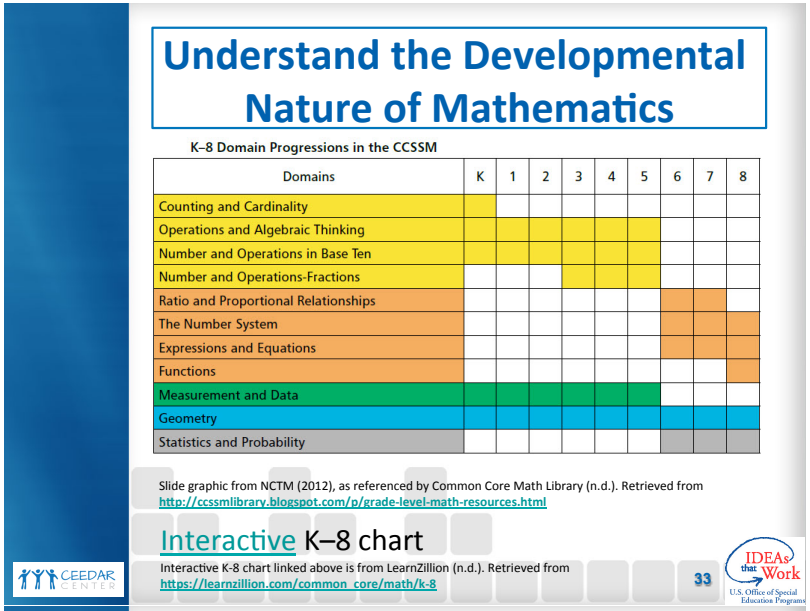
Slide 32—Five Domains of Math Proficiency

The National Research Council's *Adding It Up* report (NRC, 2001) describes five strands of mathematical proficiency. Students who are proficient should be able to exhibit these behaviors and dispositions when they are "doing math" (Van de Walle et al., 2013).



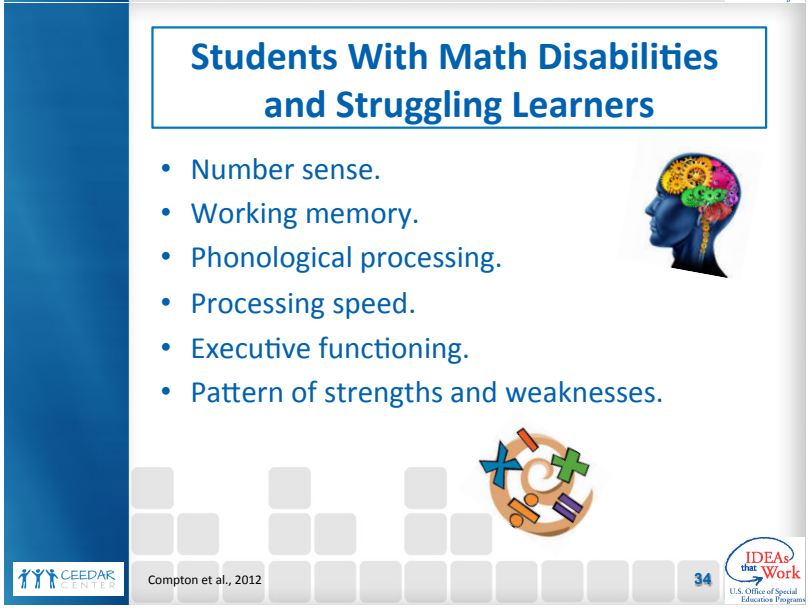
Slide 33—Understand the Developmental Nature of Mathematics

Click on the Common Core State Standards link to show participants this chart, which illustrates how the 11 domains are developed across a student's K–8 education and how they build upon each other.



Slide 34—Students With Math Disabilities and Struggling Learners

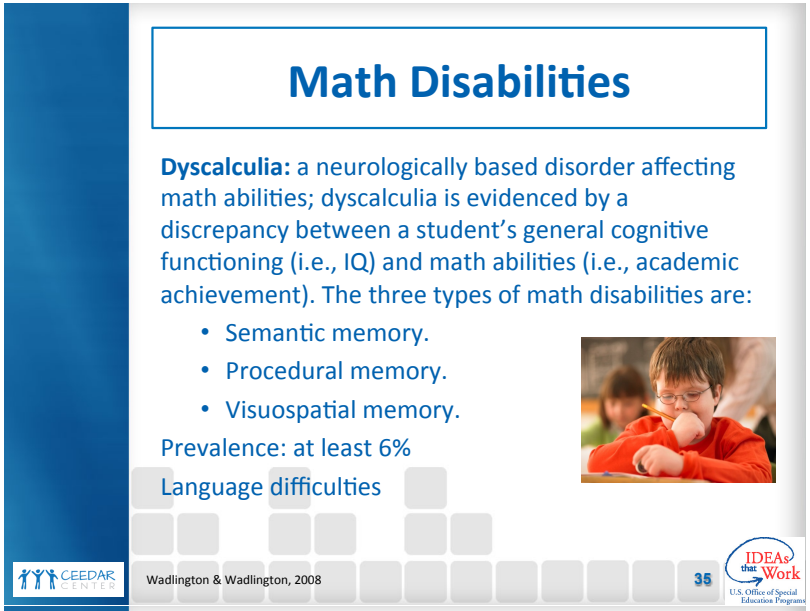
Students with disabilities may have a number of cognitive skill deficits that affect math proficiency.



Slide 35—Math Disabilities

Explanation of Dyscalculia—math disability

Approximately 6% of school-aged students have dyscalculia (Gross-Tsur, Manor, & Shalev, 1996; Kosc, 1974).

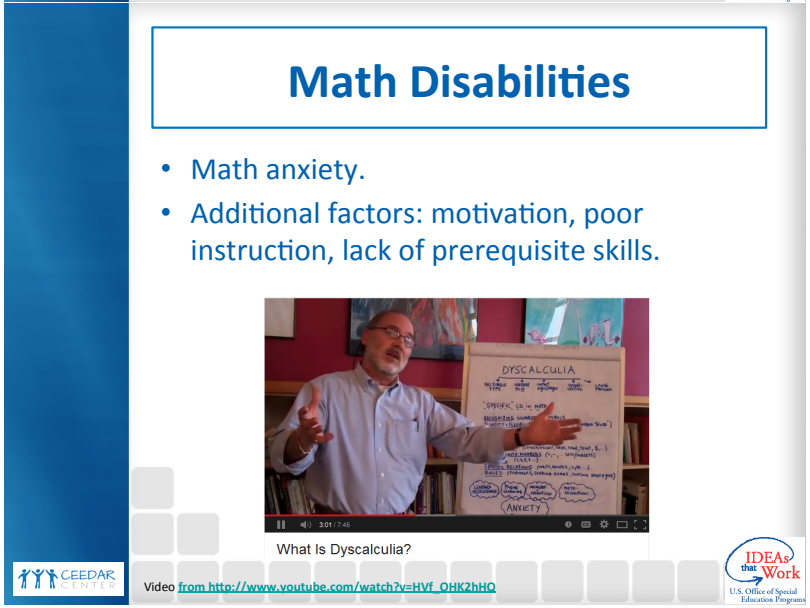


Slide 36—Math Disabilities

Dyscalculia refers to a wide range of lifelong learning disabilities involving math. **Listen to Dr. Horowitz** (published May 2012) from the National Center on Learning Disabilities talk about dyscalculia and the different elements and characteristics.

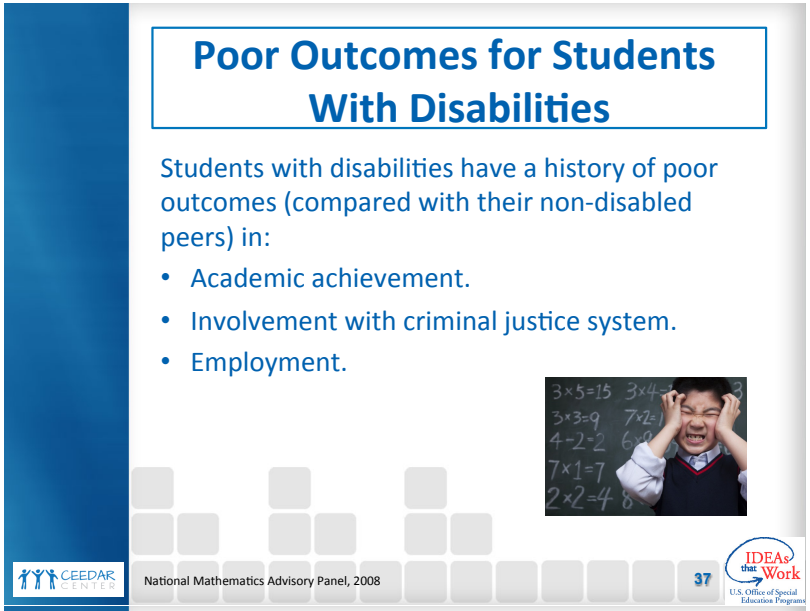
Discussion question*:* How might a student's feelings about math (i.e., affective factors) impact their math performance and later math achievement?

Video from: www.NLCD.org (2014), retrieved from http://www.youtube.com/watch?v=HVf_OHK2hHQ



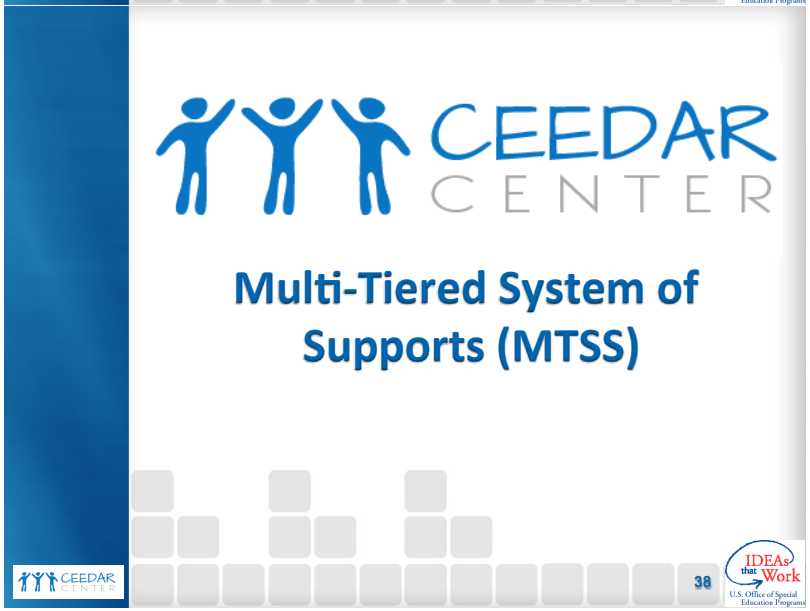
Slide 37—Poor Outcomes for Students with Disabilities

Math learning is critical for the academic success of all students.
The importance of effective math teachers (taken from NMAP, 2008, p. 35)



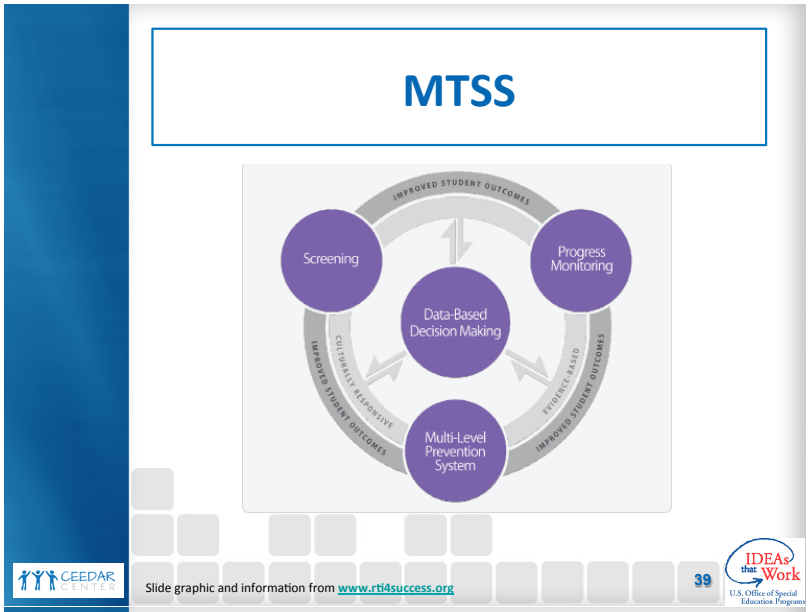
Slide 38—Multi-Tiered System of Supports

In this section, we will discuss the factors that contribute to student success, examining practices at the school and teacher level.



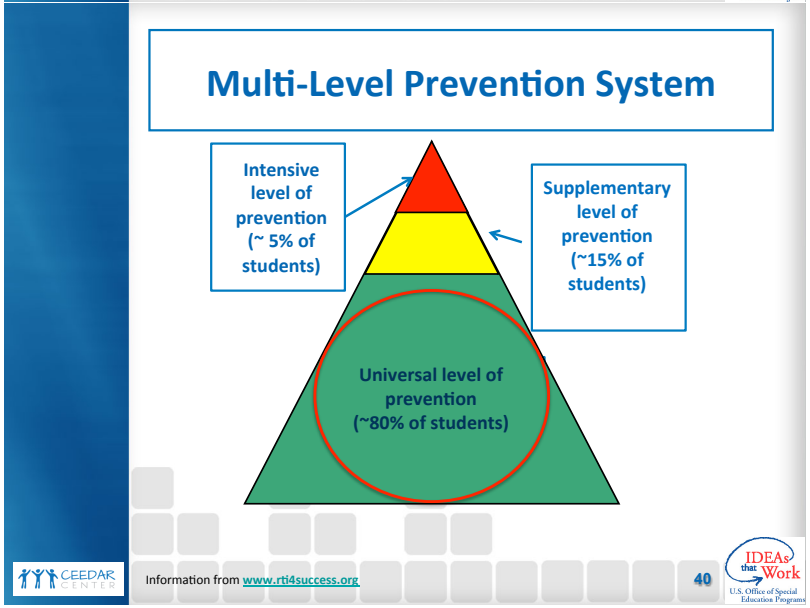
Slide 39—MTSS

MTSS is also sometimes referred to as RtI and is a framework for prevention. It integrates multiple essential components that incorporate evidence-based practices (EBPs) and culturally responsive teaching, and it focuses on improved outcomes. The MTSS framework is centered on data-based decision making.



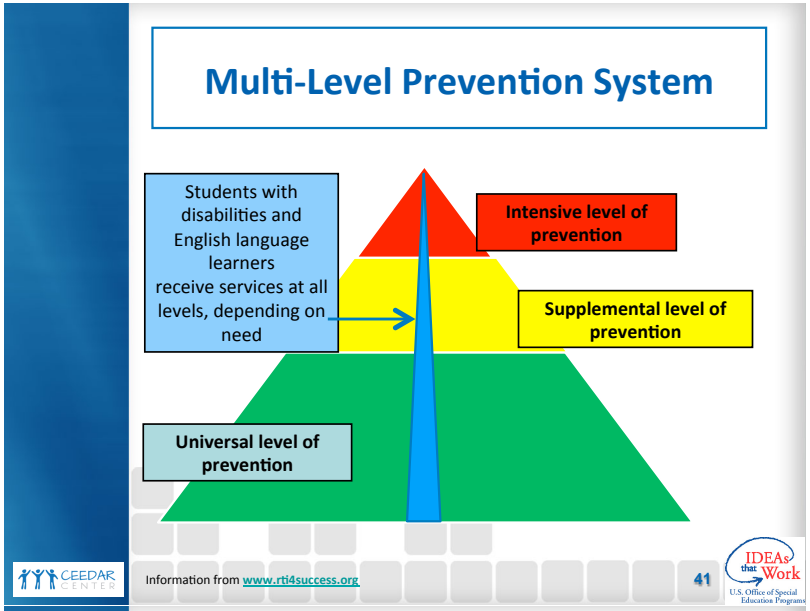
Slide 40—Multi-Level Prevention System

A multi-level prevention system includes three levels of intensity or prevention. The universal level includes high-quality core instruction. The secondary level includes evidence-based intervention(s) of moderate intensity. The intensive prevention level includes individualized intervention(s) of increased intensity for students who show minimal response to secondary prevention.



Slide 41—Multi-Level Prevention System

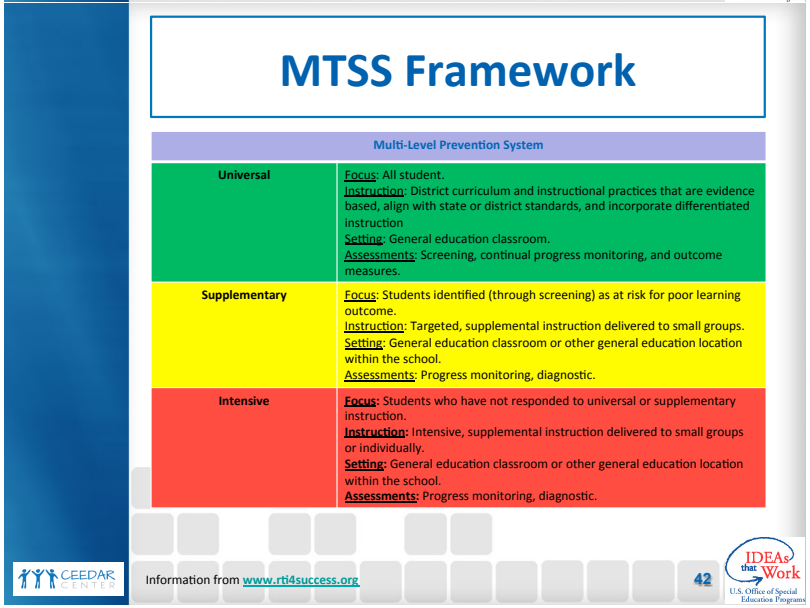
Students with disabilities and ELLs may receive service at each level, depending on their needs. If a student is receiving intensive-level instruction, he or she should still take part in universal-level instruction.



Slide 42—MTSS Framework

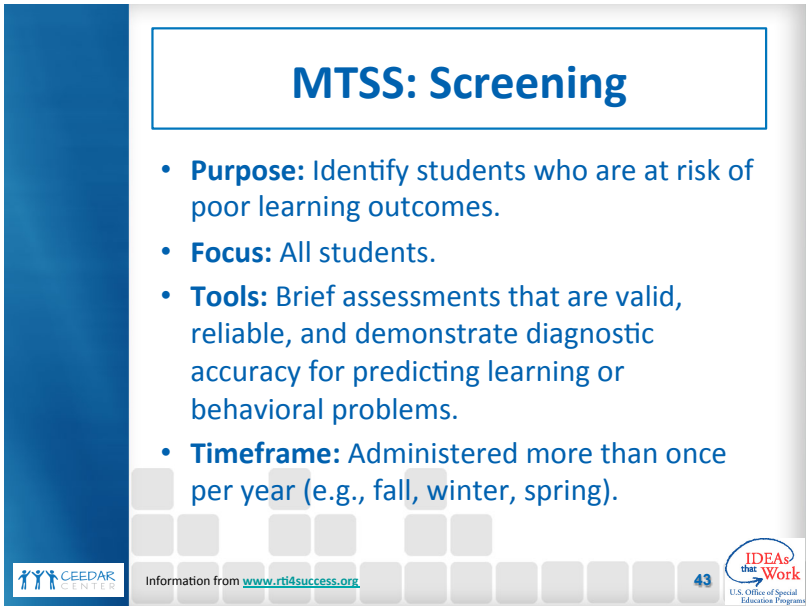
The National Center on Response to Intervention (NCRTI) has identified four essential components for RtI:

- **Screening:** a system for identifying students at risk for poor learning outcomes.
- **Progress Monitoring:** a system for monitoring the effectiveness of the supports provided to students.
- **A school-wide, multi-level prevention system** with at least three increasingly intense levels of instructional support.
- **Data-based decision making**: Decisions about student academic growth and changes to instructional practices should be based on student data.



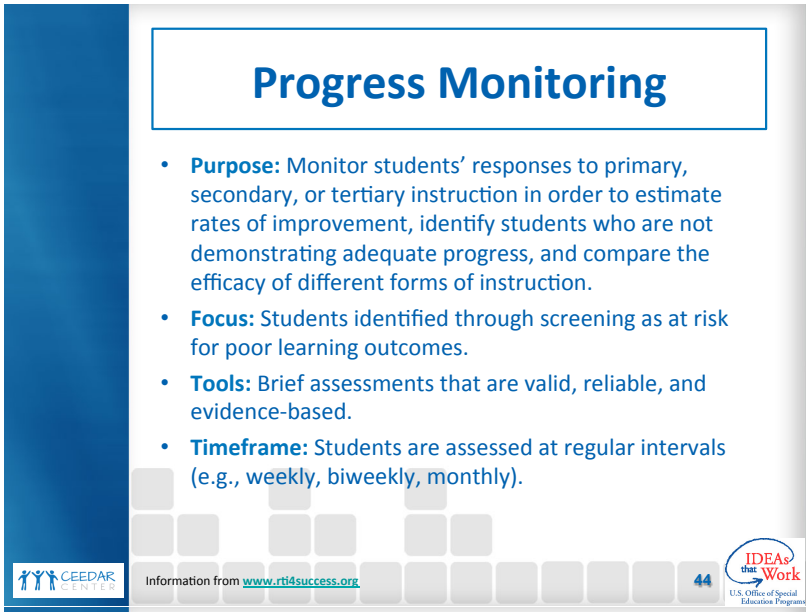
Slide 43—MTSS: Screening

MTSS uses screening tools to determine deficit areas.



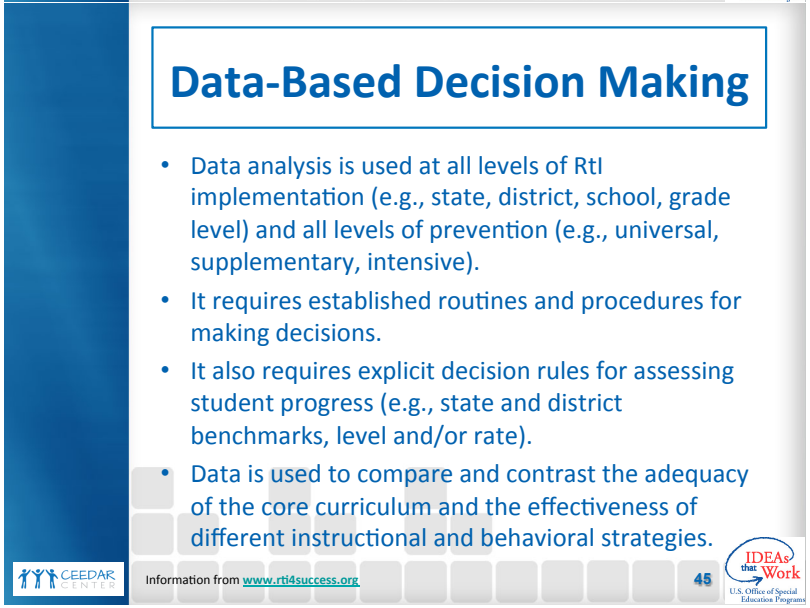
Slide 44—Progress Monitoring

Progress monitoring is a critical thread that is involved at every level of MTSS. Progress monitoring will allow teachers to make sound decisions about appropriate interventions and placement within and between MTSS levels.



Slide 45—Data-Based Decision Making

Data-based decision making is at the heart of MTSS/RtI. If the three other components are in place but data-based decision making is absent, RtI is technically not being implemented.

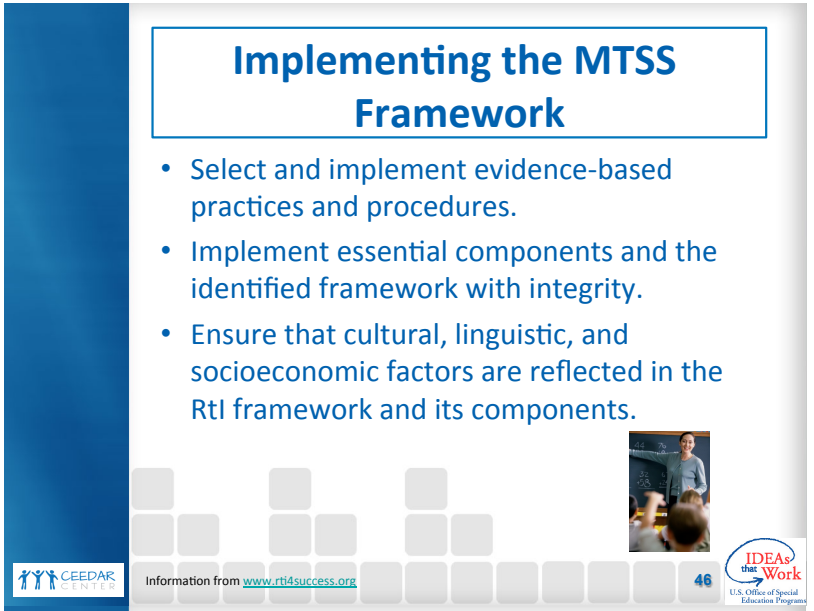


Slide 46—Implementing the MTSS Framework

Read the notes on the slide

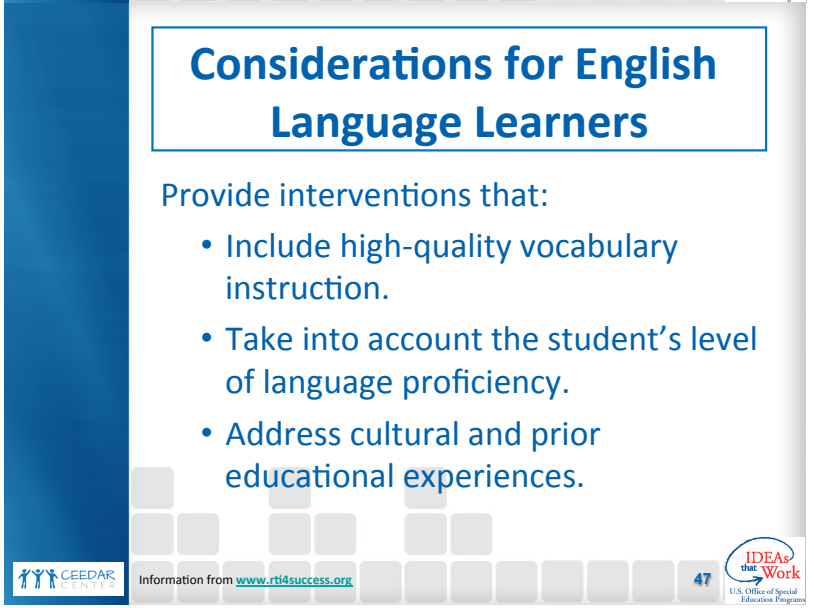
For more information, see Modules 2-4 or visit www.rti4success.org

Information from www.rti4success.org



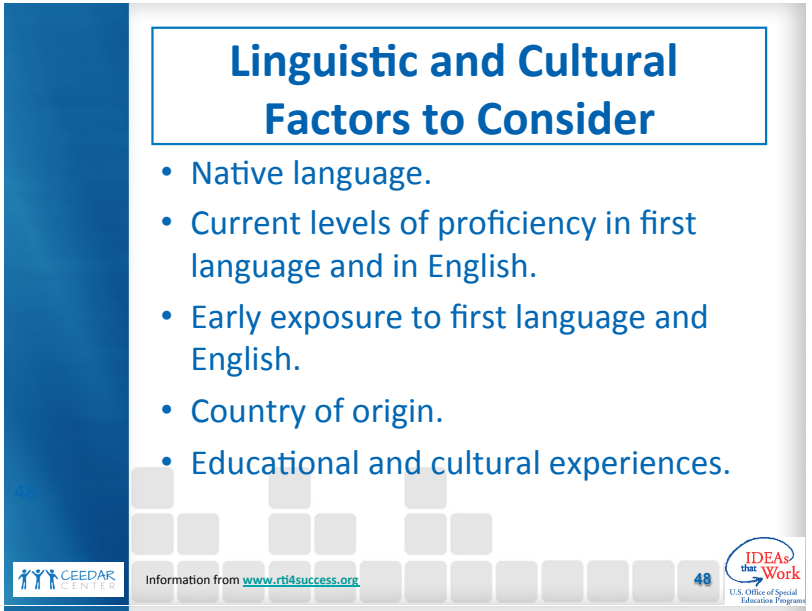
Slide 47—Considerations for English Language Learners

Research indicates that certain instructional supports are particularly beneficial for ELL content learning (August & Shanhan, 2006; Baker et al., 2014; Gersten et al., 2007).



Slide 48—Linguistic and Cultural Factors to Consider

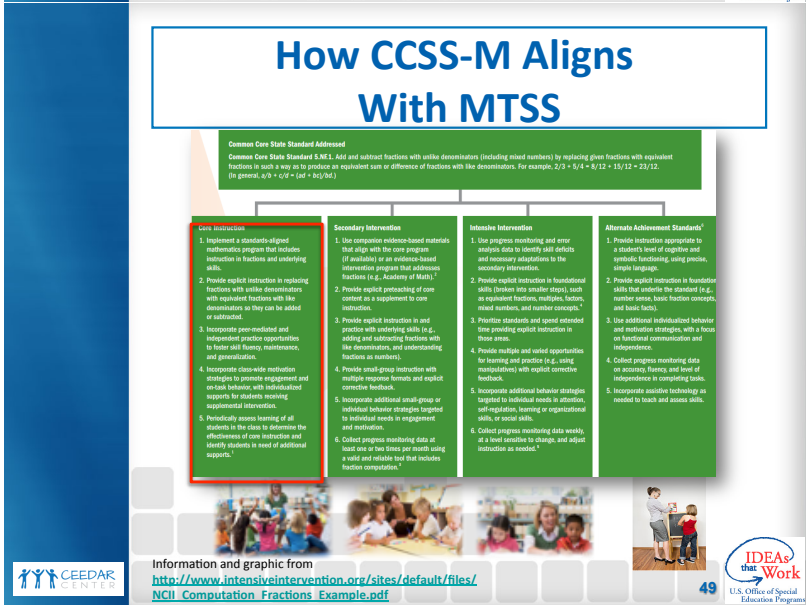
NCRTI uses the term *culturally responsive* in its framework, but another way to think of it is simply being responsive to a student's background (Esparza Brown & Sanford, 2011).



Slide 49—How CCSS-M Aligns with MTSS

Allow participants time to read the chart. Highlight the Core Instruction section, which we will discuss in more depth in Part 2.

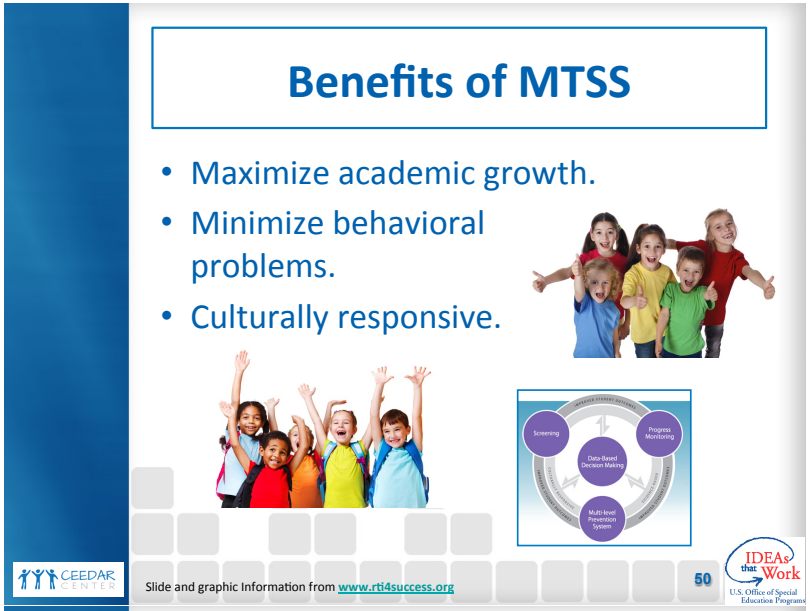
While discussing MTSS, note that the progression of supports provided at each MTSS level can—and should—be aligned with the grade-level CCSS-M standard.



Slide 50—Benefits of MTSS

MTSS is a culturally responsive framework.

Discuss the importance of culturally responsive teaching and how MTSS is more accurate way to assess the progress of culturally and linguistically diverse students.



Slide 51—Reflect and Revise: Closure Activity

Around the room, re-post the three completed charts, titled:

Chart 1- Characteristics of Successful Math Programs or Curriculum

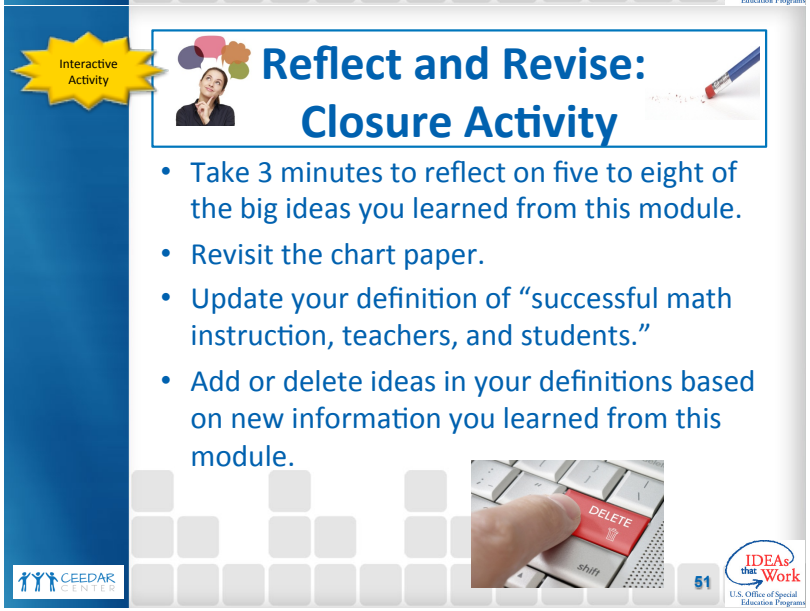
Chart 2- Characteristics of Successful Teachers

Chart 3- Characteristics of Successful Students

- Divide the participants into three groups and direct each group to a chart.
- Participants rotate from one chart to the next to add their comments and final thoughts.

(see speaker notes for more details on this activity)

Integrating the activity: Use these charts to identify participants' new knowledge. Compare the similarities and differences on the charts with the



information presented in the PowerPoint slides. Clarify any misunderstandings or confusions by revisiting the appropriate PowerPoint slide and additional citations.

Anchor Presentation Table of Contents and Handouts

Part 1: Introduction (4 subparts)

- ✧ Why Is Mathematics Education So Important?
- ✧ Characteristics of Successful Math Programs, Teachers, and Students
- ✧ How Mathematical Thinking Develops
- ✧ Multi-Tiered System of Supports

Part 2: Universal Math Instruction (6 subparts)

- ✧ What is Universal Instruction in MTSS?
- ✧ What Does High-Quality Mathematics Instruction at the Universal Level Look Like?
- ✧ What Are Considerations for Universal Math Instruction in the Common Core State Standa
- ✧ What Are the Roles of Screening and Progress Monitoring at the Universal Level?
- ✧ What is the Process for Data-Based Decision Making?
- ✧ Case Study: Meet Ethan and Mr. Math

Part 3: Supplemental Math Interventions (6 subparts)

- ✧ What Are Supplemental Interventions?
- ✧ The Implementation Process
- ✧ The Importance of Choosing Evidence-Based Math Interventions and Implementing Them Fidelity
- ✧ Research-Based Activity: Evaluating an Evidence-Based Math Intervention Program
- ✧ Measuring Student Progress
- ✧ Case Study: Following Ethan

Part 4: Intensive Math Interventions (10 subparts)

- ✧ What Are Intensive Math Interventions?
- ✧ Data-Based Individualization (DBI): The Foundation of Intensive Intervention
- ✧ The Implementation Process
- ✧ DBI Step 1: Secondary Intervention Delivered With Greater Intensity
- ✧ DBI Step 2: Progress Monitoring
- ✧ DBI Step 3: Diagnostic Assessment
- ✧ DBI Step 4: Adaptation
- ✧ Intensive Intervention in Mathematics
- ✧ DBI Step 5: Continued Progress Monitoring, Analysis, and Adaptation
- ✧ Case Study: Following Ethan

Handouts

Part 1

- ✧ Handout 1: A Guide to 8 Mathematical Practice Standards
- ✧ Handout 2: Creating Baselines and Goal Lines
- ✧ Handout 3: Concrete-to-Representational-to-Abstract (C-R-A) Instruction

Part 2

- ✧ Handout 4: Questions for Sticky Note Carousel
- ✧ Handout 5: Investigating the Evidence for Universal Math Programs
- ✧ Handout 6:Using the Tools Chart to Evaluate Screening Tools

- ✧ Handout 7: Pick and Chips
- ✧ Handout 8: Write and Right
- ✧ Handout 9: Case Study: Meet Ethan and Mr. Math

Part 3

- ✧ Handout 10: The Implementation Process for Supplemental Math Interventions
- ✧ Handout 11: Selecting Evidence-Based Supplemental Math Intervention Programs
- ✧ Handout 12: Worksheet for Identifying Intervention Program Effectiveness
- ✧ Handout 13: Calculating Slope and Determining Responsiveness to Intervention
- ✧ Handout 14: Supplemental Math Intervention Case Study at Bear Lake

Part 4

- ✧ Handout 15: The Five Steps in the Implementation Process of Intensive Math Interventions (DBI)
- ✧ Handout 16: Case Study at Bear Lake: Determining Response at the Intensive Level (Ethan)

This content was produced under U.S. Department of Education, Office of Special Education Programs, Award No. H325A120003. Bonnie Jones and David Guardino serve as the project officers. The views expressed herein do not necessarily represent the positions or polices of the U.S. Department of Education. No official endorsement by the U.S. Department of Education of any product, commodity, service, or enterprise mentioned in this website is intended or should be inferred.

The CEEDAR Center

University of Florida
360 Norman Hall
PO Box 117050
Gainesville, FL 32611

www.ceedar.org
ceedar@coe.ufl.edu
352.273.4259

2630_07/14