

Teaching to Big Ideas

California Mathematics Framework 2021

February 24th, 2021

*A Part of the California Math Council Framework Conversations Series
and
Co-hosted by San Diego Unified School District*

2021 Framework Writing Team:

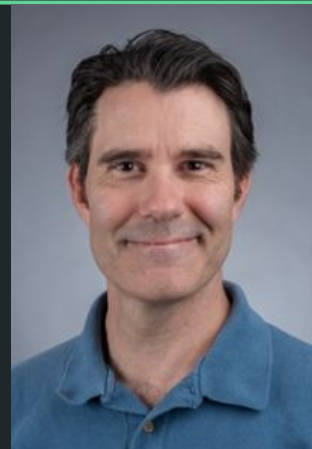
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Chapter 13. Glossary: Acronyms and Terms

Goals for Today's Session: *Making Sense of Big Ideas*

- Introduce concept of organizing teaching to Big Ideas
- Discuss how Chapter 2 frames Big Ideas
- Examine how Content Connections, Drivers of Investigation and Standards for Math Practice fit together
- Look at two sample vignettes from Framework
- Touch on forthcoming Distance Learning document
- Reminder to participate in Public Comment Period 1

Teaching to “Big Ideas”

- Rather than organizing teaching at the individual standards level, teaching to Big Ideas reveals important concepts and the ways concepts are connected more fully.
- Approaching instruction through Big Ideas and connections allows time for students to more deeply explore fundamental ideas which can link multiple practice and content standards.
- The same content is actually taught and learned but the organization into Big Ideas allows for a more coherent approach.

(adapted from What is Mathematical Beauty? Boaler, Munson, Williams, 2017)

Chapter 2: Teaching for Equity and Engagement

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Introduction

Five Components of Equitable and Engaging Teaching

1. Plan Teaching Around Big Ideas
2. Use Open, Engaging Tasks
3. Teach Toward Social Justice
4. Invite Student Questions and Conjectures
5. Center Reasoning and Justification

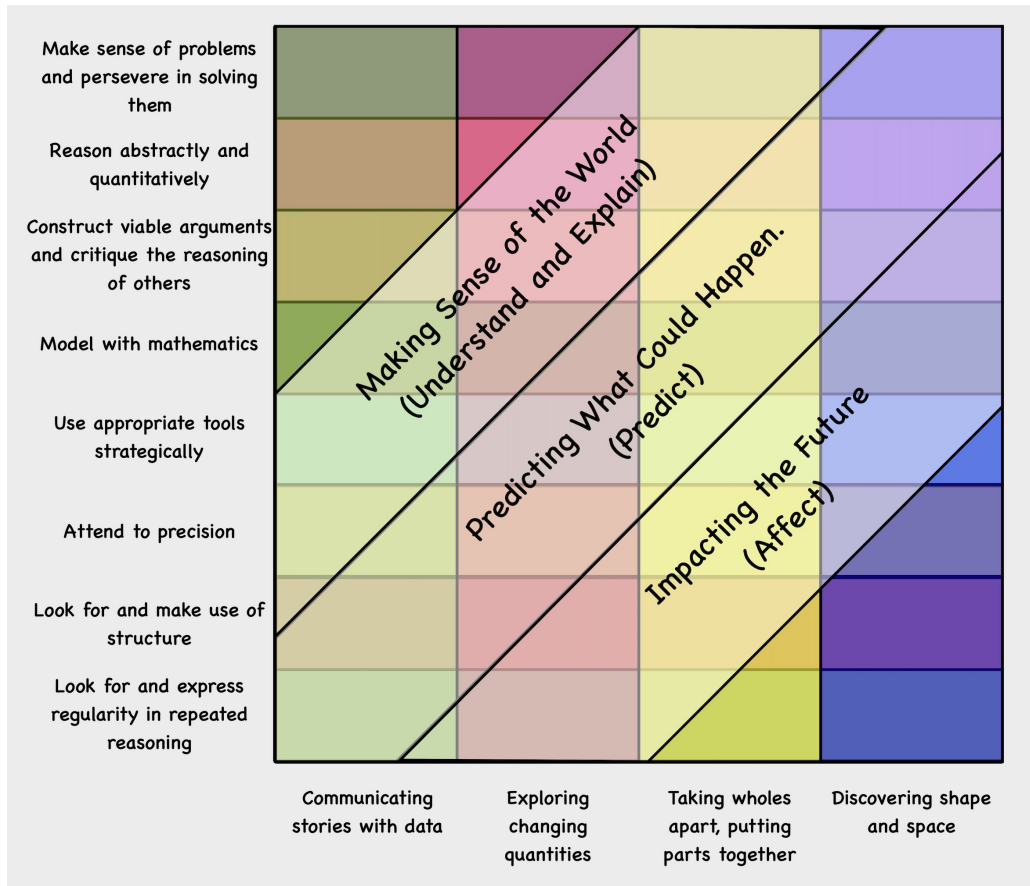
Conclusion

Universal Design for Learning Guidelines

Component 1: Plan Teaching Around Big Ideas

Big Ideas Motivate and Connect

A *big idea* pairs content with mathematical practices in the context of an authentic investigation.



Drivers of Investigation (DIs)

- Purpose for learning mathematics
- “Why are we doing this?”

(DI 1) Making Sense of the World (Understand and Explain)

(DI 2) Predicting What Could Happen (Predict)

(DI 3) Impacting the Future (Affect)

Content Connections (CCs)

- Organize the content into four major themes across grades
- Can connect to each other (e.g. Exploring changing quantities by Taking wholes apart and putting parts together)
- Develop when students have opportunities to actively investigate mathematics.

(CC 1) Communicating Stories with Data

(CC 2) Exploring Changing Quantities

(CC 3) Taking Wholes Apart, Putting Parts Together

(CC 4) Discovering Shape and Space

Common Core State Standards for Mathematical Practice (SMPs)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Three Aspects of Big Ideas

Ex. In a lesson about...

Model with mathematics

(SMP) with...

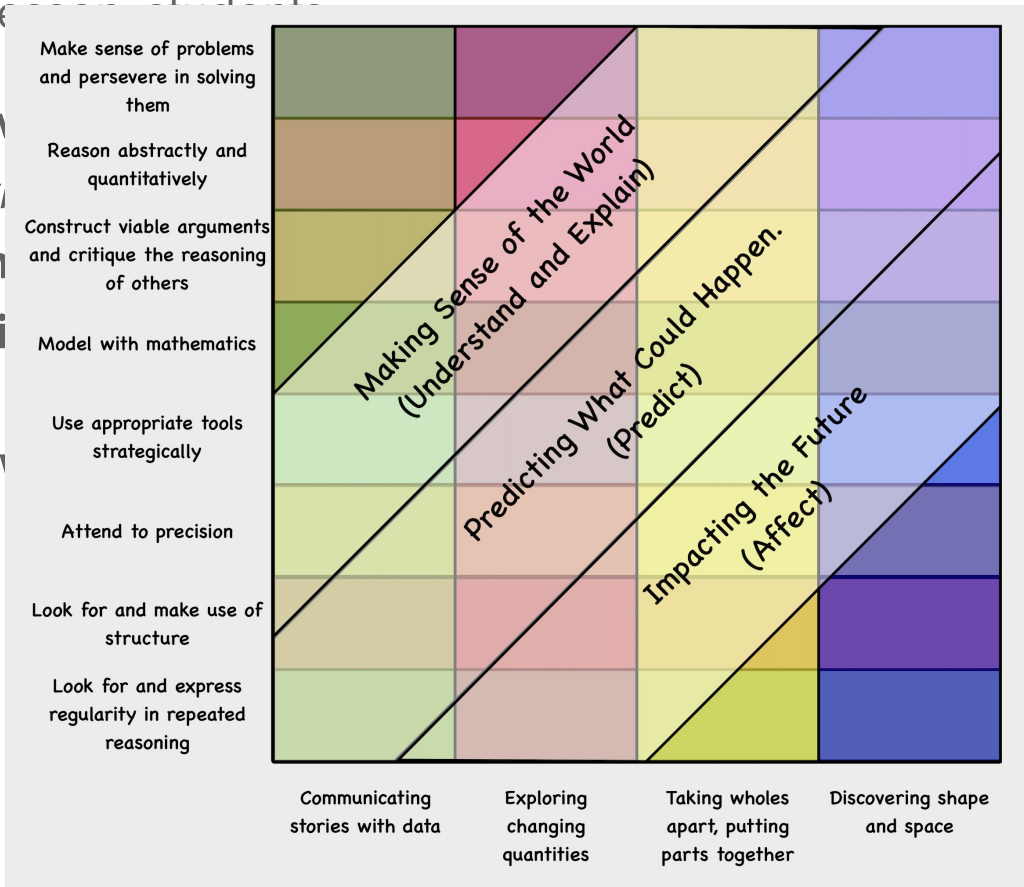
Exploring

Quantitative relationships

in order to

Predict

(DI).



Ch 2, Component 2: Use Open, Engaging Tasks

- Open tasks (low floor, high ceiling) enable students to take ideas to different levels, use different representations, and express understanding in multiple ways (key principle of UDL)
- Open tasks provide teachers with opportunity to listen carefully, make sense of student thinking and assess formatively
- Engaging tasks are authentic -- to students (puzzle or game, improving accessibility for a friend, assist younger grades in planning a garden)
- Open, engaging tasks create meaningful group conversation opportunities (see Smith and Stein, 2011)

3-5 grade Vignette: Santikone Builds Rectangles to Find Area

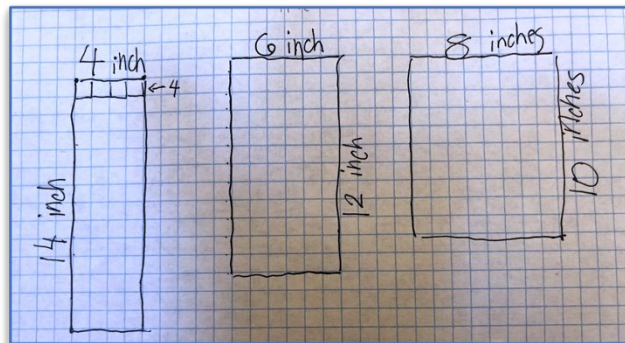
In a third grade class, students have been studying multiplication concepts, and are now investigating area and perimeter. Their teacher poses this task:

Our challenge is to find all the ways to make a rectangle with a loop of string that is 36 inches long. Then we will make some decisions about what these rectangles could be used for, and which would be the best choices.

Session Participants: In the chat, type the dimensions of one rectangle the students might find in their investigations. **Please don't submit your response until we give the signal, so all responses will arrive at once.**

3-5 grade Vignette: Santikone Builds Rectangles to Find Area

Our challenge is to find all the ways to make a rectangle with a loop of string that is 36 inches long. Then we will make some decisions about what these rectangles could be used for, and which would be the best choices.



- What mathematical practices will be engaged? (SMPs)
- What important content connections will emerge? (CCs)
- Which driver of investigation provides purpose? (DIs)
- <https://www.cde.ca.gov/ci/ma/cf/documents/mathfwchapter6.docx>

Middle/High Vignette/Task - Finding Volume of a Lemon

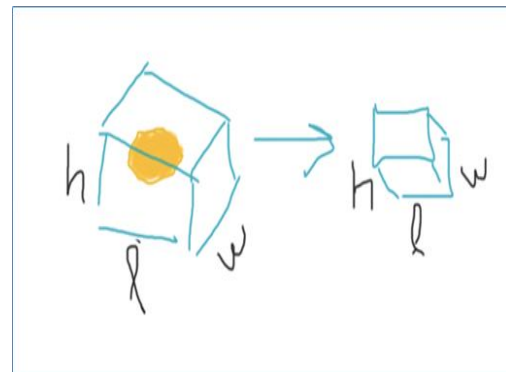
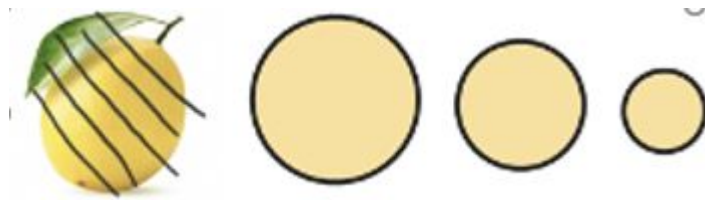
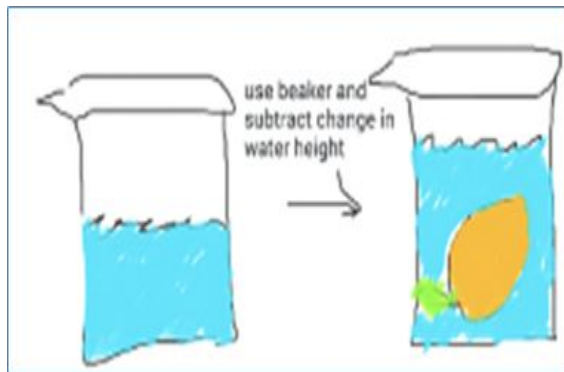
Course: High School Integrated 2/MIC 2/MIC—Modeling with Functions

- Marina Lopez is preparing to teach her integrated high-school mathematics class 2, with a group-based interactive task that will help prepare students for learning calculus. Her plan is to ask students to consider ways to find the volume of a complex shape, specifically a lemon.
- Prior to class Marina has set up a table with supplies including different colors of modeling clay, vases, plastic knives, pipe cleaners, scissors, etc.
- She opens the task on the first day holding up a lemon and asks the class, “How can we find the volume of a lemon?”
- **Session Participants:** What are some ways you can think of to determine the volume? Please type your answer in the chat but don't send until you received the signal :).

Middle/High Vignette/Task - Finding Volume of a Lemon

Course: High School Integrated 2/MIC 2/MIC—Modeling with Functions

- She opens the task on the first day holding up a lemon and asks the class, “How can we find the volume of a lemon?”



- What mathematical practices will be engaged? (SMPs)
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- Which driver of investigation provides purpose? (DIs)

State Legislation to Choose more important Content

California
Department of
Education

Government agency

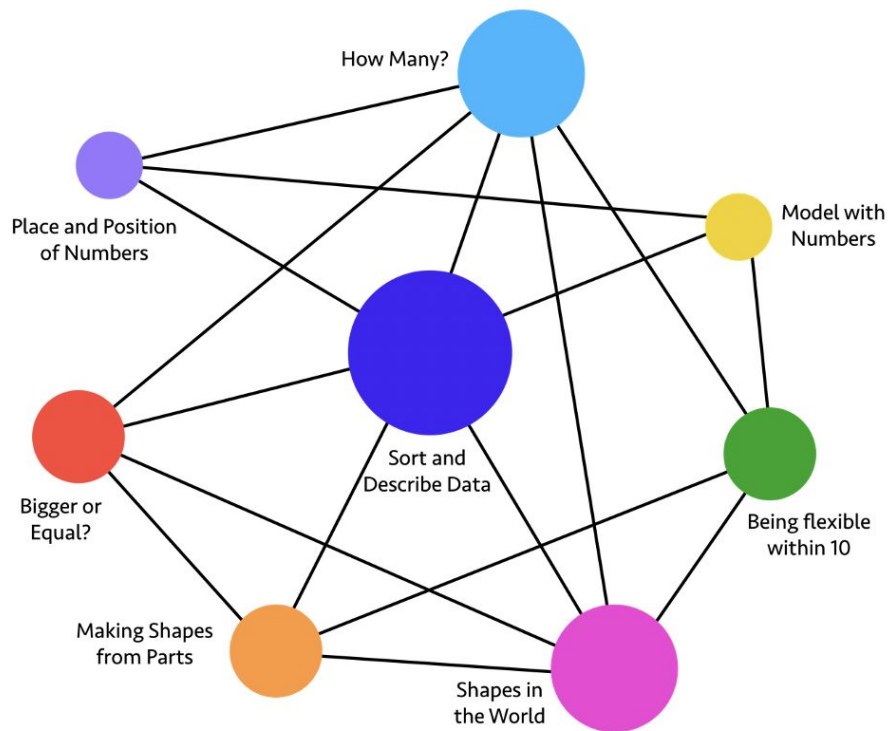


Mathematics Team: Jo Boaler & Cathy Williams

Teachers/leaders will be given “slimmed down” content in May 2020

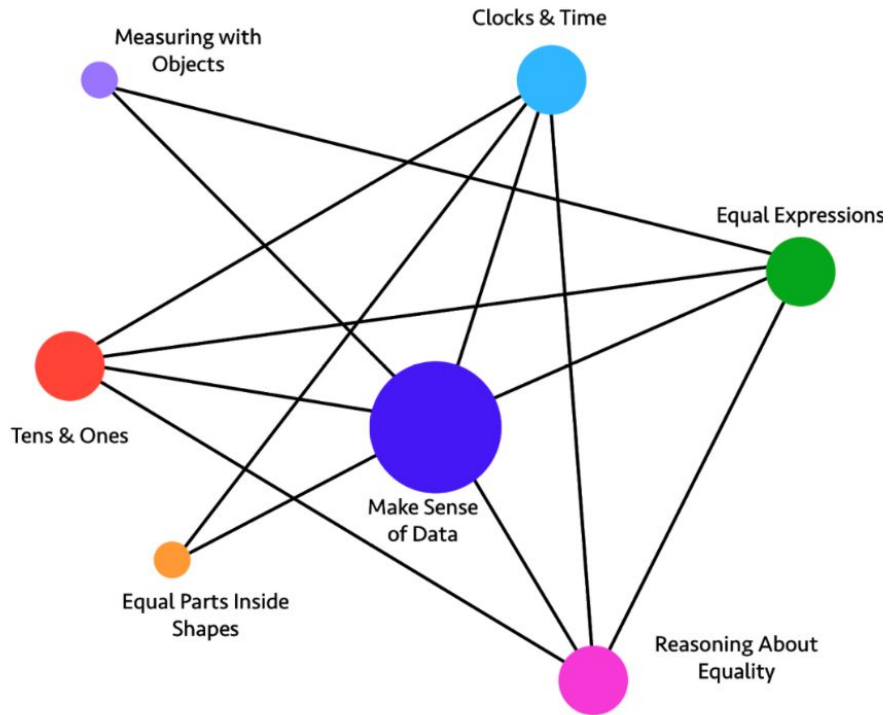
Content	Big Idea	Standards
Communicating Stories with Data	Sort & Describe Data	MD.1, MD.2, MD.3, CC.4, CC.5, G.4: Sort, count, classify, compare and describe objects using numbers for length, weight or other attributes. Fingers are important representations of numbers. Use words and drawings to make convincing arguments to justify work.
Exploring Changing Quantities	How Many?	CC.1, CC.2, CC.3, CC.4, CC.5, CC.6, CC.7, MD.3: Know number names and the count sequence to determine how many are in a group of objects arranged in a line, array, or circle.
Exploring Changing Quantities	Bigger or Equal?	CC.4, CC.5, CC.6, MD.2, G.4: Identify a number of objects as greater than, less than, or equal to the number of objects in another group. Justify or prove your findings with number sentences and other representations.
Taking Wholes Apart, Putting Parts Together	Being Flexible within 10	OA.1, OA.2, OA.3, OA.4, OA.5, CC.6, G.6: Make 10, add and subtract within 10, compose and decompose within 10, (find 2 numbers to make 10). Fingers are important.
Taking Wholes Apart, Putting Parts Together	Place and position of numbers	CC.3, CC.5, NBT.1: Get to know numbers between 11 and 19 by name and expanded notation to become familiar with place value, for example: $14 = 10 + 4$
Taking Wholes Apart, Putting Parts Together	Model with numbers	OA.1, OA.2, OA.5, NBT.1, MD.2: Add, subtract, and model abstract problems with fingers, other manipulatives, sounds, movement, words and models.
Discovering Shape and Space	Shapes in the World	G.1, G.2, G.3, G.4, G.5, G.6, MD.1, MD.2, MD.3: Describe the physical world using shapes. Create 2-D and 3-D shapes, and analyze and compare them.
Discovering Shape and Space	Making shapes from parts	MD.1, MD.2, G.4, G.5, G.6 Compose larger shapes by combining known shapes. Explore similarities and differences of shapes using numbers and measurements

Grade K

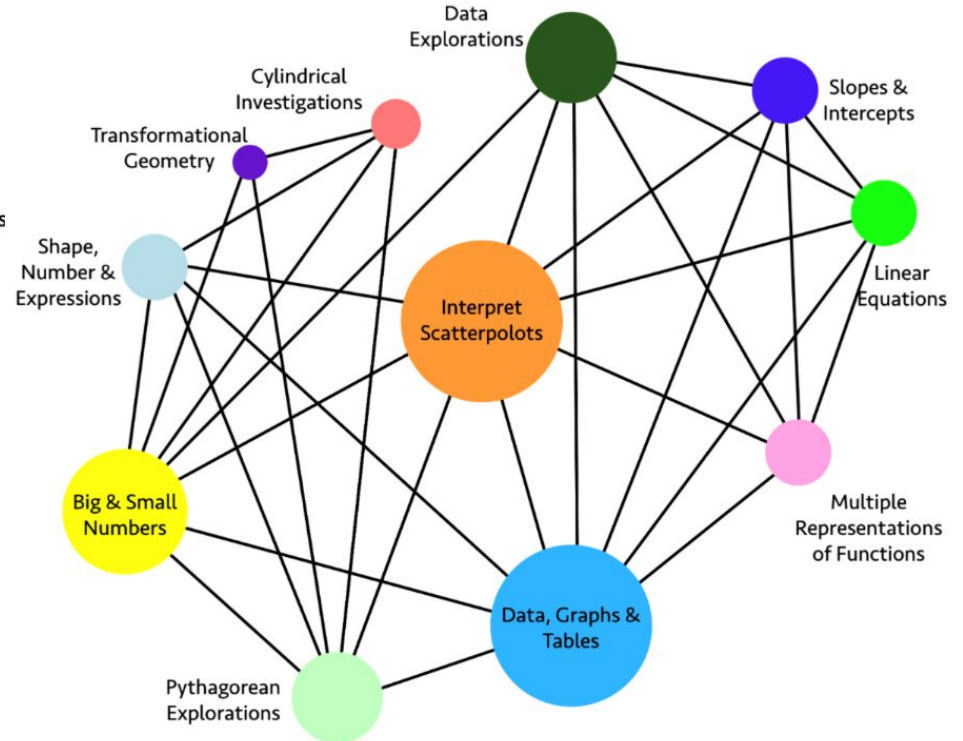


Other grade level Big Idea diagrams

First Grade



Eighth Grade



Reminder to Participate in Public Comment Periods

- First public comment period: Feb 8 - April 8, 2021
- To read and comment on chapters - www.cde.ca.gov/ci/ma/cf/
- Second public comment period: June 2 - July 31st, 2021
- Receive CDE notifications about the Mathematics Framework: bit.ly/ca2021fw

Thank you!

Examples, video clips

TK–2 Would You Rather Math -- coin options; Big Idea? Driver? Content Connections?

3–5 Class is making a recipe book. We collect data on number who eat in each home, choose a favorite recipe that has at least 4 ingredients. Determine our recipes will all have n servings. How many portions for each recipe? Should n be the mean number of eaters or the mode or what if bimodal?

6–8

9–12

Would You Rather Math:

<https://www.wouldyoura>

A

A stack of
14 pennies
7 nickels
2 dimes
1 quarter

B

A stack of
2 pennies
4 nickels
2 dimes
2 quarters



Problem

Using the digits 1 to 9 exactly once, put a digit in each box to create and place 4 fractions on the number line in the correct order. Fractions B & C are equal.

