COLORADO
Department of Education

Making Math Meaningful: Supporting 9th Graders' Numeracy

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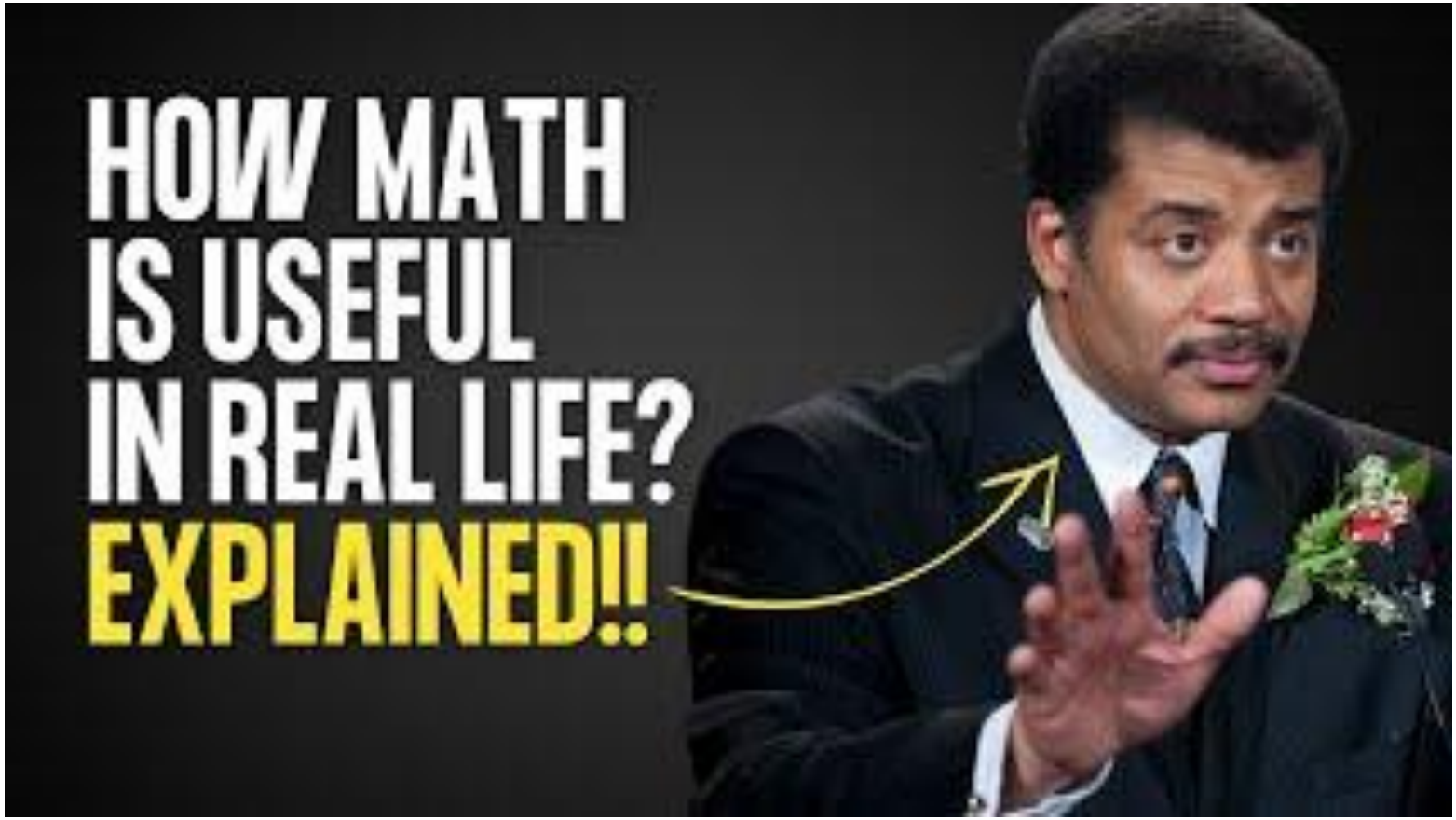
Challenge

Memorize this number:

371115192327

Why Math? Why 9th Grade?



Why Math? Why 9th Grade?

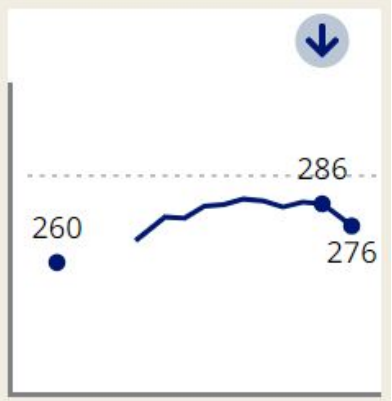
8th grade NAEP scores by race/ethnicity from 1990-2022

White

Black

Hispanic

2 or more races



Consequences for Failing 9th Grade Algebra

- Decreased odds to graduate
  - 1 in 5
- Disproportionately impacting minoritized students
- Exacerbated by COVID pandemic
- Delays higher ed entry

- Gates Foundation, 2021

Instructional Supports: What could this look like?

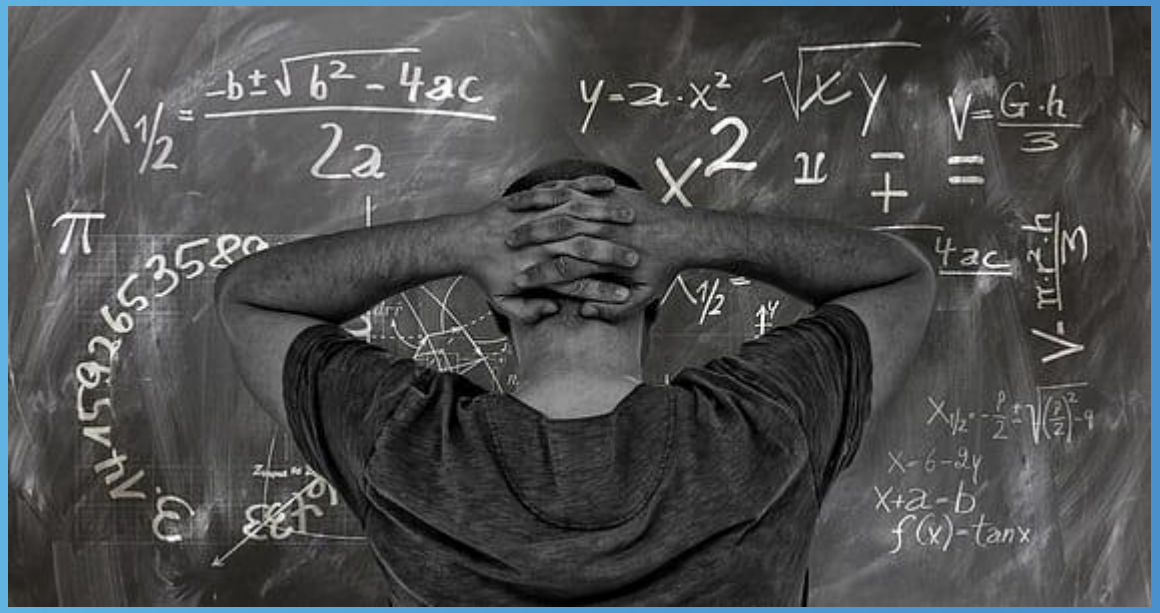
Core instructional approaches

- Improving PLC practices
- Consistent grading
- Core common instructional practices
- Core common math practices
- SEL
- Trauma Informed Practices and classrooms
- etc

Intervention approaches

- Unit recovery
- Skill building intervention
- Credit recovery (2nd semester)
- etc

Time to do some math!

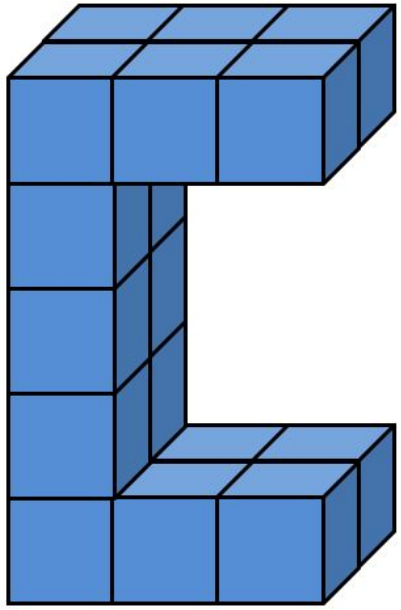


Reactions

- What's your math background?
- What emotions did the last slide elicit?

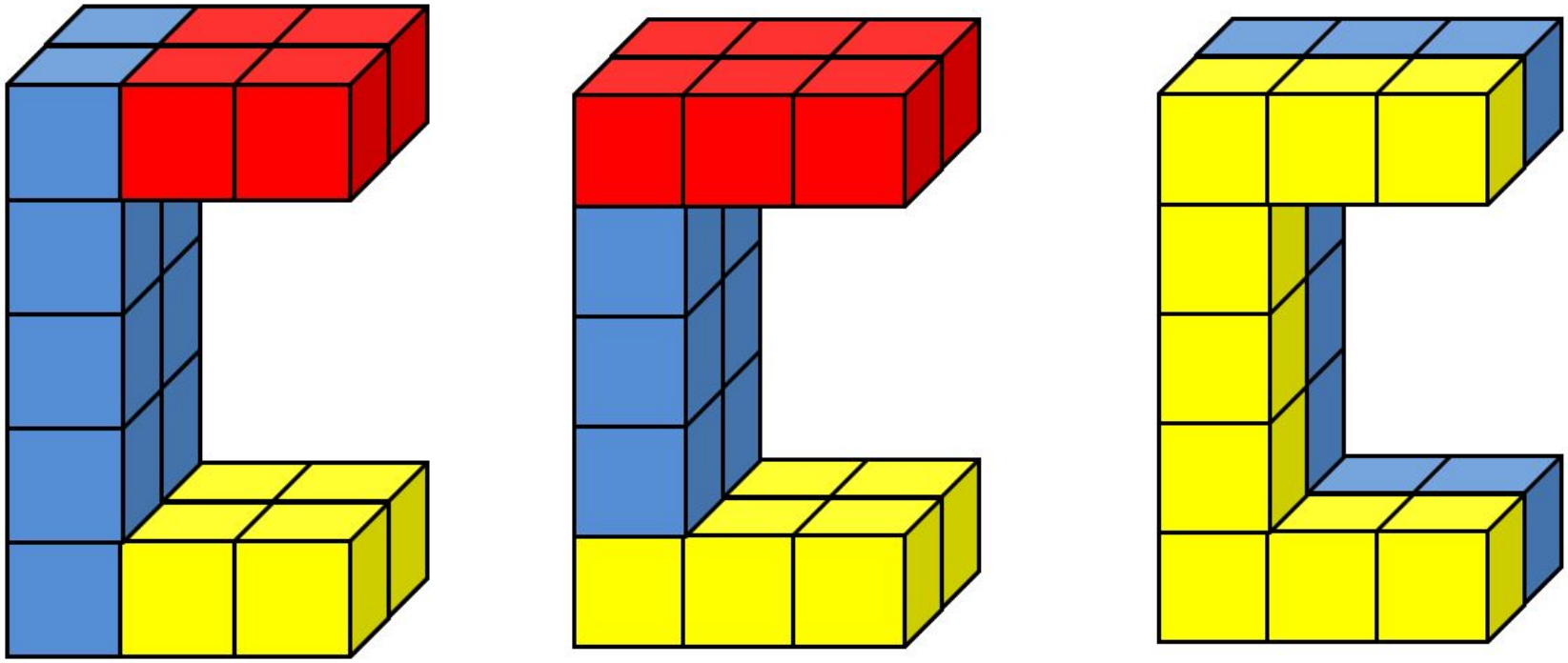
Estimation, Spacial Reasoning

How many unit cubes make up this figure?



Explain how you know, how do you see it?

Estimation, Spacial Reasoning



Estimation, Spacial Reasoning

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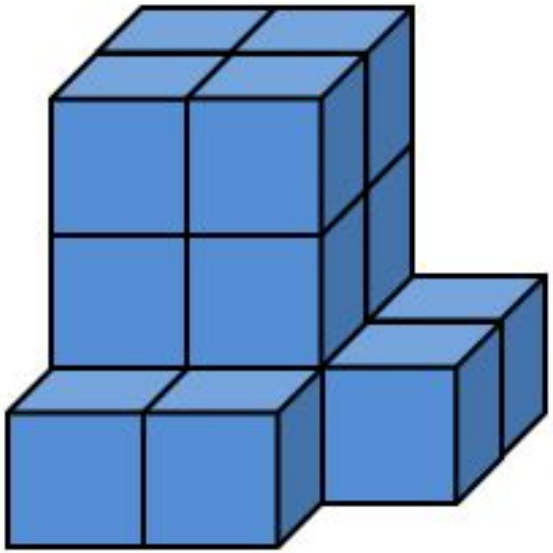


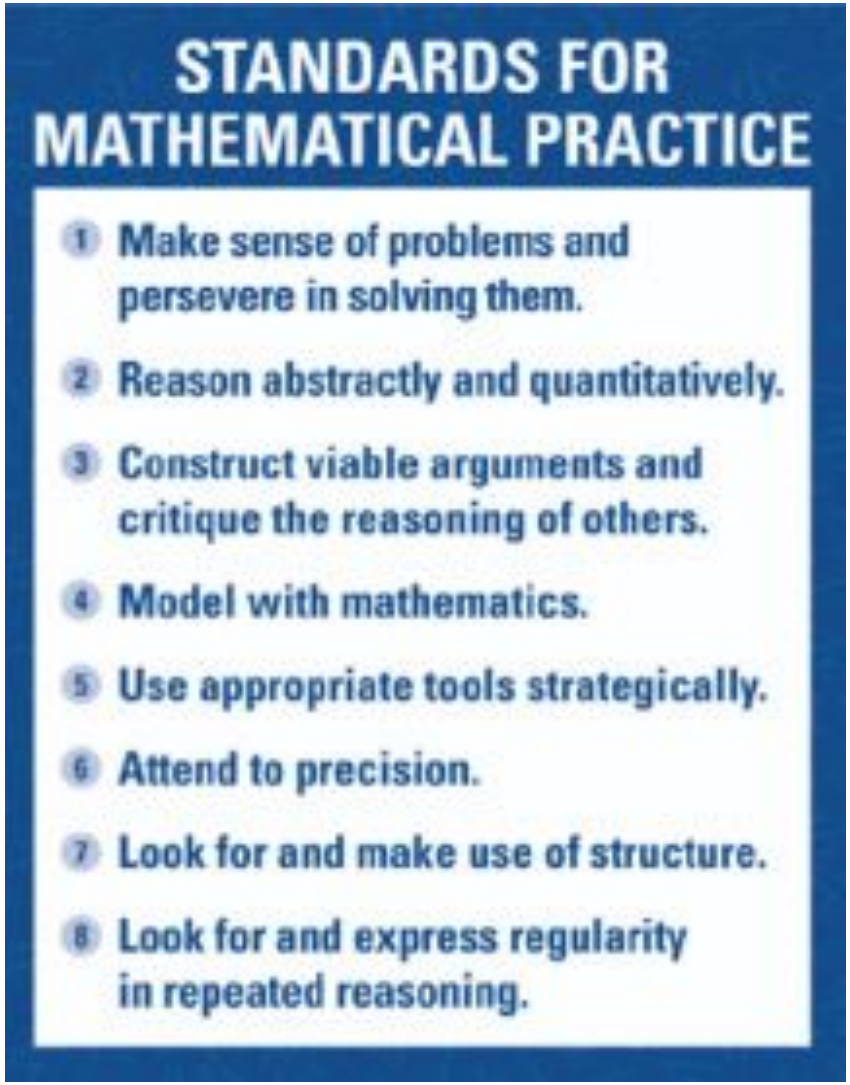
Explain how you know, try to figure out at least two different ways to see it.

Notice and Wonder

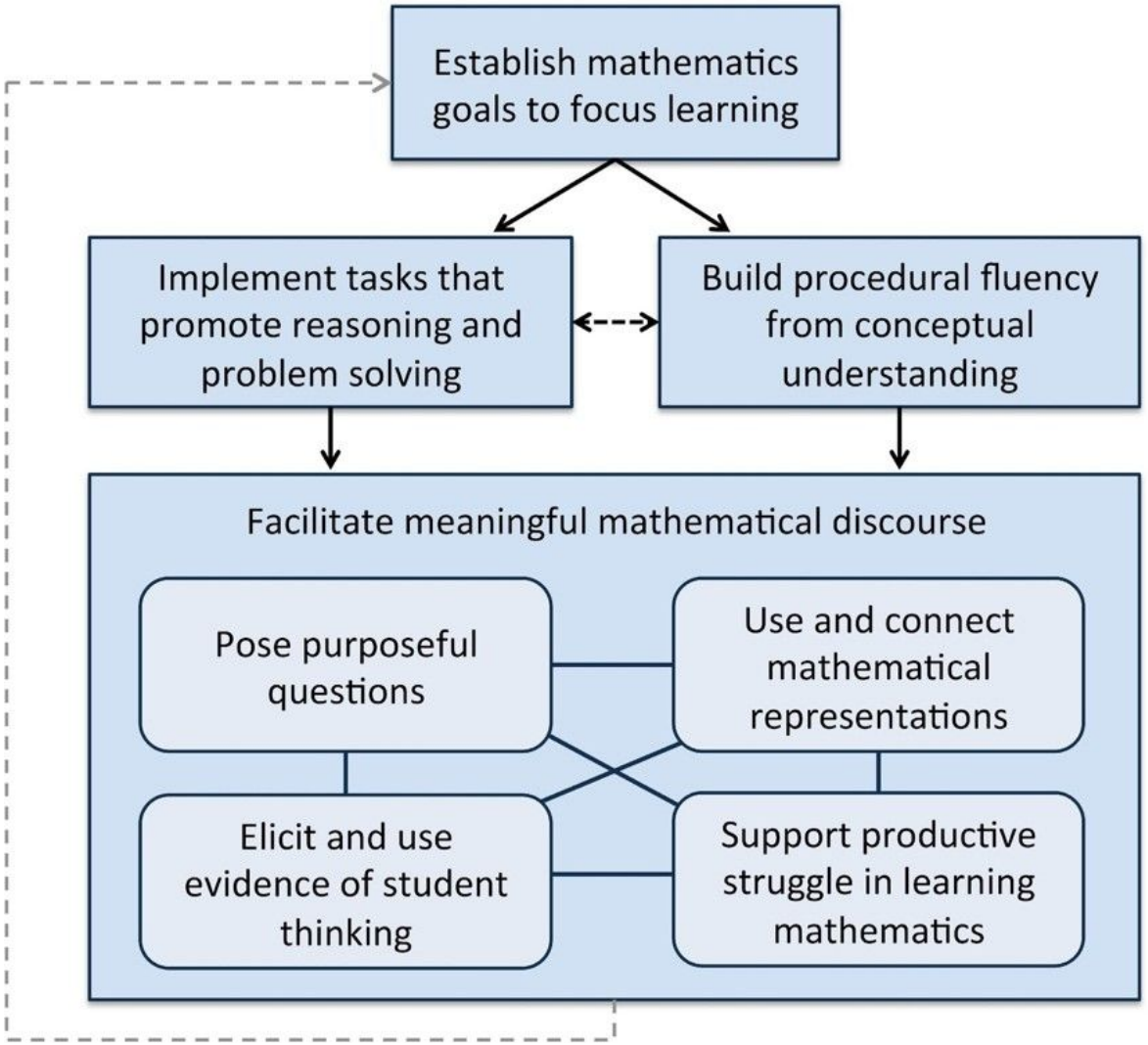
- What did you notice about that overall experience? What was the room like?

- What do you wonder about the set up of that activity in general?

NCTM's Standards for Mathematical Practice



Math Teaching Framework



Observation Card

THE 5x8 CARD

SERP

Student Vital Actions	Principles
All students participate (e.g., boys and girls, ELL and special needs students), not just the hand-raisers.	Equity requires participation. A ➤
Students **say a second sentence** (spontaneously or prompted by the teacher or another student) to extend and explain their thinking. CCSS-M practices 1 | 2 | 3 | 6	Logic connects sentences. B ➤
Students **talk about each other's thinking** (not just their own). CCSS-M practices 1 | 2 | 3 | 6 | 7 | 8	Understanding each other's reasoning develops reasoning proficiency. C ➤
Students **revise their thinking**, and their written work includes revised explanations and justifications. CCSS-M practices 1 | 2 | 3 | 4	Revising explanations solidifies understanding. D ➤
Students look for more precise ways of expressing their thinking, encouraging each other to look for and use **academic language**. CCSS-M practices 3 | 6	Academic language promotes precise thinking. E ➤
English learners produce language that communicates ideas and reasoning, even when that language is imperfect. CCSS-M practices 1 | 2 | 3 | 6	ELLs develop language through explanation. F ➤
Students **engage and persevere** at points of difficulty, challenge, or error. CCSS-M practice 1	Productive struggle produces growth. G ➤

Observation Card

About Looking for Standards in the Mathematics Classroom

The Common Core State Standards (CCSS) define eight standards for students' Mathematical Practice. You will find evidence of the students' practices by observing their actions and by reviewing their work. This card is intended to focus attention on some of the vital student actions that will be observable in CCSS-M classrooms (see reverse). However, not all standards will be evident at all times or applicable for every activity.

The practices are available at corestandards.org

A ➤ **Equity requires participation:** Explaining one's ideas and hearing the reactions of others promotes learning. Thus in classrooms in which a few students do all the talking, learning opportunities are distributed inequitably. Over time silent students may come to believe they are not expected to talk, and may disengage entirely. When all students are given the time to explain their thinking, a greater investment of every student in the instructional activity is demanded and rewarded, and the opportunity for students to serve as learning resources for each other is maximized.

B ➤ **Logic connects sentences:** A hallmark of the understanding prioritized by the CCSS-M is the ability to use mathematical reasoning to construct and defend an argument *(this is what I did and why it makes sense)*. Brief, single-sentence student utterances are generally insufficient for a viable argument.

C ➤ **Understanding each other's reasoning develops reasoning proficiency:** Students learn about mathematics by exploring their own and others' reasoning in problem-solving situations. Actively listening to peers increases the time focused on mathematical thinking and promotes the cognitive flexibility that is highly valued in college and career.

D ➤ **Revising explanations solidifies understanding:** As students become more mathematically proficient and their reasoning improves, they should be able to identify flaws in their own and others' thinking. Revising work as a routine matter leads to better problem solving.

E ➤ **Academic language promotes precise thinking:** Mathematically proficient students comprehend and produce mathematical representations (symbolic expressions, graphs, tables, number lines, etc.) that are embedded in ordinary and academic explanations and justifications. Students comprehend and produce the paragraphs, sentences, phrases and words characteristic of justifications, explanations and word problems typical for their grade level.

F ➤ **ELLs develop language through explanation:** English learners may hesitate to speak in class precisely because their control of English is limited. But practice speaking allows them to become more proficient. Bridging the language barrier is important for ELLs to thrive in the types of classrooms the CCSS-M promotes.

G ➤ **Productive struggle produces growth:** When students persist in making sense of a challenging problem and trying different strategies for solution, they are more likely to learn the mathematics than students who give up quickly or avoid challenge to the greatest extent possible.

OAKLAND UNIFIED SCHOOL DISTRICT

math.serpmedia.org/5x8card
revised 9/26/14

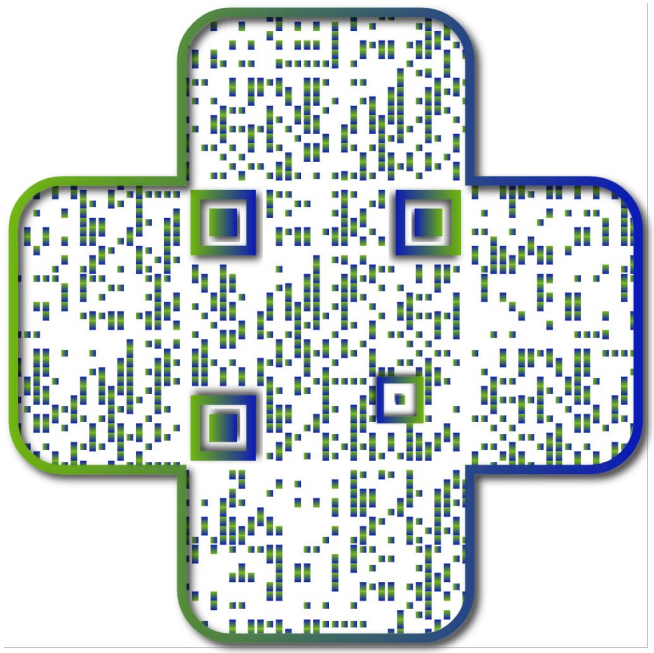
SFUSD SAN FRANCISCO PUBLIC SCHOOLS

CDE

Shameless Plug

Online, asynchronous professional development course covering all aspects of these teaching strategies and then some. Free 12 month access to this material for all people working in a math education capacity in Colorado (including district, BOCES, charter network, and community based organizations)

Pre-register here to start in June!



Call Back!

What was that number from earlier?

371115192327

3 7 11 15 19 23 27

Procedural Fluency from Conceptual Understanding

- Conceptual understanding must precede and coincide with instruction on procedures.

- Procedural fluency requires having a repertoire of strategies.

- Basic facts should be taught using number relationships and reasoning strategies, not memorization.

- Assessing must attend to fluency components and the learner. Assessments often assess accuracy, neglecting efficiency and flexibility.
    - NCTM position paper

Practice for challenges

- How might we use number relationships and reasoning strategies to help us remember these numbers?

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3612244896192

Institute of Education Sciences' Evidence-based Practices

Improving Mathematical Problem Solving in Grades 4 Through 8 (2018)

5 Recommendations

Tier 1 – Strong evidence

Assist students in monitoring and reflecting on the problem-solving process.

Teach students how to use visual representations.

Tier 2 – Moderate evidence

Expose students to multiple problem-solving strategies.

Help students recognize and articulate mathematical concepts and notation.

Tier 4 – Minimal Evidence

Prepare problems and use them in whole-class instruction.

Teaching Strategies for Improving Algebra Knowledge in Middle and High School Students (2019)

3 Recommendations

Tier 2 – Moderate evidence

Teach students to intentionally choose from alternative algebraic strategies when solving problems.

Tier 4 – Minimal Evidence

Use solved problems to engage students in analyzing algebraic reasoning and strategies.

Teach students to utilize the structure of algebraic representations.

How does this impact tutoring and interventions?

Tutoring

- Coherence, Consistency and Coordination

Math Intervention Strategies

- Collective Math Reasoning
- Developing Math Self-Concept
- Personalized Learning with Technology
- Socially and Culturally Responsive Interventions

- Hanover Research, 2022

Brainstorm

- How do the topics from this discussion fit with your current math plans?

- Which aspects of your math plans can be emphasized more?

- Which areas might need reinforcement?

Sources

NAEP Report Card for 8th grade Math

Gates Foundation article

National Council of Teachers of Mathematics website

Observation card

Procedural fluency from conceptual understanding paper

What Works Clearinghouse

Hanover Math Intervention research

Thank you!

Feedback

https://tinyurl.com/NGACDE

Next Steps

By June 2024, all sites will have completed the following:

- **Site Visit**: Completed a visit to a site currently implementing the Ninth Grade Success model
  - Friday, 2/16 8:00am-12:00pm - Thompson Valley HS
  - Friday, 3/1 Center HS
  - Wednesday 3/20 8:00am-2:30pm- Poudre HS
- **CDE Training**: Participated in training on the key components of the 9th grade success model.
- **Training For Ninth Grade Team**: Provided training for majority of 9th grade staff that includes at minimum:
  - Components of the Ninth-Grade success model and key structures for implementation
  - Design of and planning time for the Transition program
- **Updated budget**
  - May 15, 2024