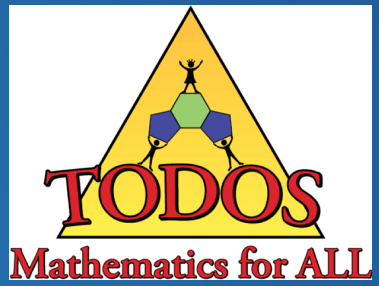
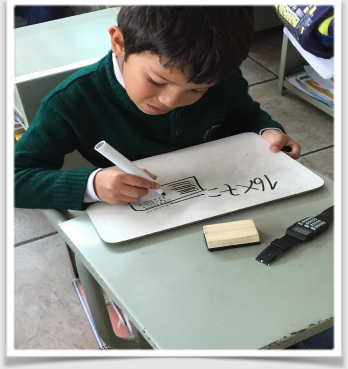
Supporting Critical and Creative Thinking Tools for English Learners



Erin Sylves
ESOL Instructional Support Secondary Mathematics
Rose Moore
PreK-12 Mathematics Coordinator
Fairfax County Public Schools VA

TODOS 2016

TODOS Mathematics for ALL



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JUNE 23-25, 2016

SCOTTSDALE, AZ

SCOTTSDALE PLAZA RESORT

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TODOS
Mathematics for ALL

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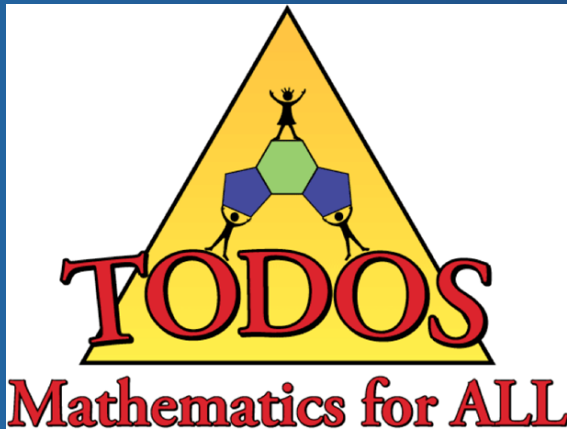
Just Like Me...



I am a classroom teacher.

I work at the district/county level to support instruction.

I support Mathematics instruction

This is my first time to Boston.

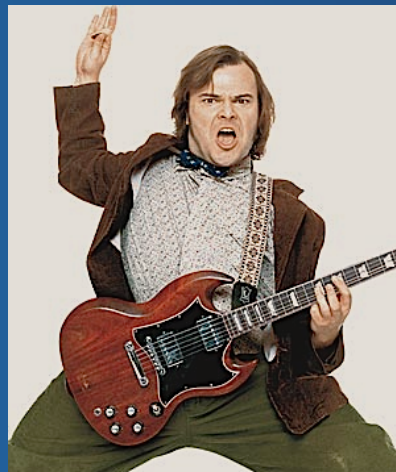
This is my first NCTM conference.

I’m excited to be here!

#NCTMBoston

Rock star teacher!

Close your eyes and think of your favorite teacher. What fond memories do you have of them?



Visualization

Turn to a shoulder partner and discuss what qualities describe a rock star teacher.

OUTCOMES

Learn the **WHAT**, **WHY**, and **HOW** of using critical and creative thinking strategies to raise the rigor for all students.

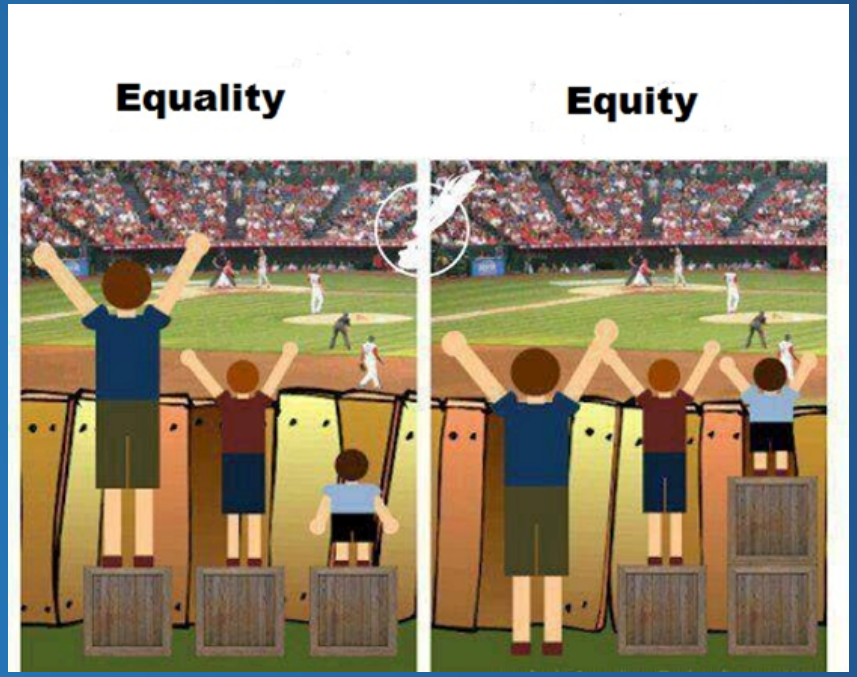
Begin planning ways to support your staff with implementing critical and creative thinking strategies in their everyday instruction.

Today's students need to be critical thinkers, problem solvers, and effective communicators who are proficient in both core subjects and new 21st century skills.

Ken Kay, President, Partnership for 21st Century Skills

Every student should have equitable and optimal opportunities to learn mathematics free from bias- intentional or unintentional- based on race, gender, socioeconomic status, or language. In order to close the achievement gap, all students need the opportunity to learn challenging mathematics form a well-qualified teacher who will make connections to the background, needs, and cultures of all learners. -NCTM

So how do we provide support and meet the needs of our students?



DECISIONS
& OUTCOMES

POINT OF VIEW

FLUENCY, ORIGINALITY
FLEXIBILITY &
ELABORATION

QUESTIONING

VISUALIZATION

ANALOGIES

PLUS, MINUS,
INTERESTING

MINDMAPPING

ENCAPSULATION

Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Beliefs about teaching and learning mathematics	
Unproductive beliefs	**Productive beliefs**
Mathematics learning should focus on practicing procedures and memorizing basic number combinations.	Mathematics learning should focus on developing understanding of concepts and procedures through problem solving, reasoning, and discourse.
Students need only to learn and use the same standard computational algorithms and the same prescribed methods to solve algebraic problems.	All students need to have a range of strategies and approaches from which to choose in solving problems, including, but not limited to, general methods, standard algorithms, and procedures.
Students can learn to apply mathematics only after they have mastered the basic skills.	Students can learn mathematics through exploring and solving contextual and mathematical problems.
The role of the teacher is to tell students exactly what definitions, formulas, and rules they should know and demonstrate how to use this information to solve mathematics problems.	The role of the teacher is to engage students in tasks that promote reasoning and problem solving and facilitate discourse that moves students toward shared understanding of mathematics.
The role of the student is to memorize information that is presented and then use it to solve routine problems on homework, quizzes, and tests.	The role of the student is to be actively involved in making sense of mathematics tasks by using varied strategies and representations, justifying solutions, making connections to prior knowledge or familiar contexts and experiences, and considering the reasoning of others.
An effective teacher makes the mathematics easy for students by guiding them step by step through problem solving to ensure that they are not frustrated or confused.	An effective teacher provides students with appropriate challenge, encourages perseverance in solving problems, and supports productive struggle in learning mathematics.

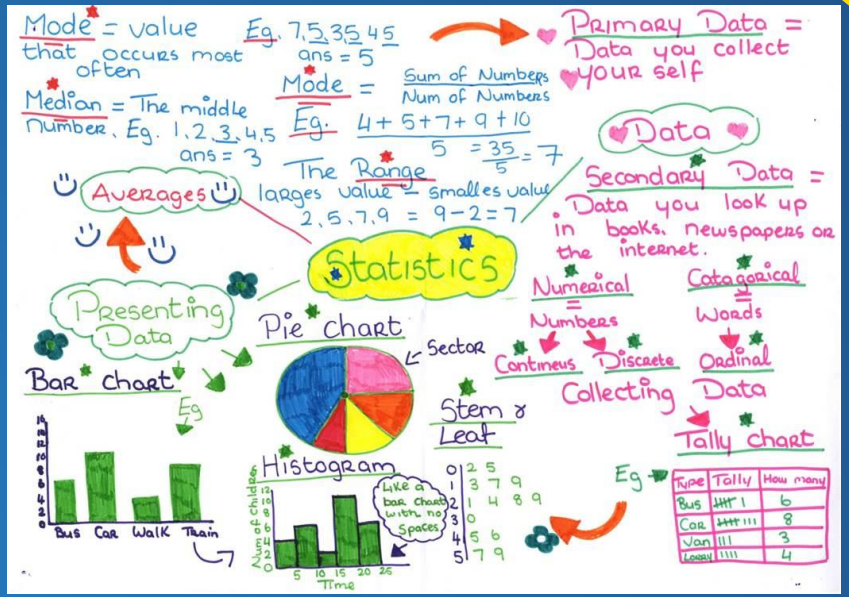
VIRGINIA (Process Goals)	NCTM (Process Standards)	CCSS (Mathematical Practices)
Mathematical Problem Solving	Problem Solving	1) Make sense of problems and persevere in solving them.
Mathematical Communication	Communication	3) Construct viable and critique the reasoning of others
Mathematical Reasoning	Reasoning and Proof	2) Reason abstractly and quantitatively
Mathematical Connections	Connections	7) Look for and make use of structure
		8) Look for and express regularity in repeated reasoning
Mathematical Representations	Representations	4) Model with mathematics
		5) Use appropriate tools strategically
		6) Attend to precision

Challenges facing English Learners and their teachers

- Not only must ELs learn the mathematics content, but they also must do so while learning vocabulary, the structure of the language, and mathematics discourse.

- Delaying ELs participation in true problem solving until they have mastered English is not an option.

Mindmapping



https://www.dropbox.com/sh/ro1bvcny9ahkssm/GUCeM9w4__/Mind%20Map%20-%201-16_1.mp4

Create your own: Solving Equations

Possible supports:

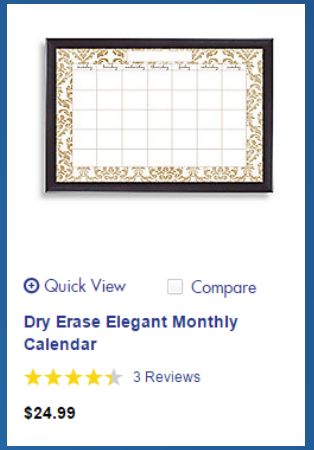
- word bank
- pictures
- partially started chart
- open notes
- other ideas...

Decisions and Outcomes

Understanding that choosing from alternatives affects event which follow

Coupon Conundrum

You are in BBB and are looking to buy a dry erase calendar that costs $24.99. You have both the 20% and $5 off coupon. Which one will you decide to use and why? Explain your thinking.



Reflection

 Green	Plus
Yellow	Minus
 Blue	Interesting

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TODOS Website: http://www.todos-math.org

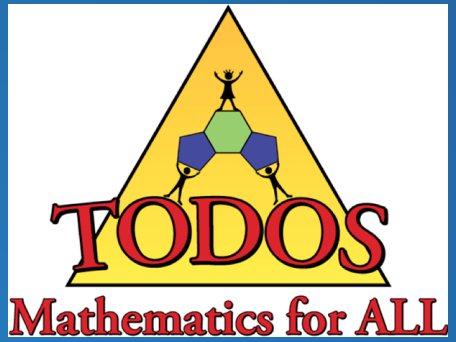
TODOS
Mathematics for ALL

Visit the TODOS Booth

in the Exhibit Hall

Booth # 844

Thank you!



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