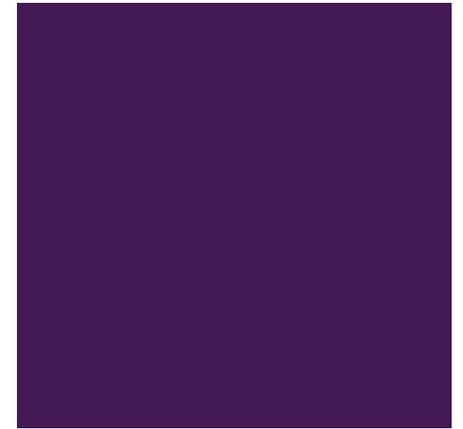
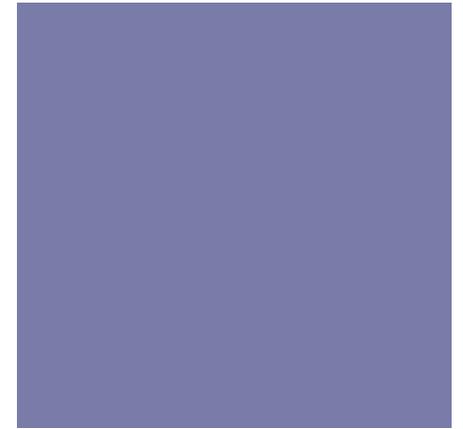
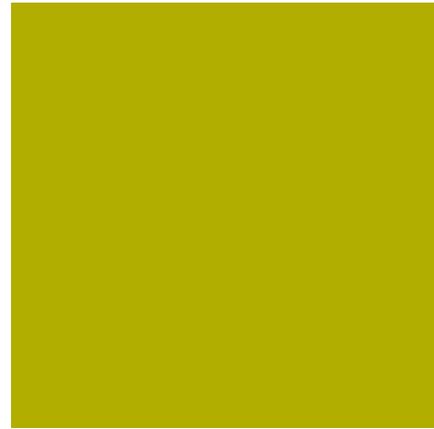




**Math
Practice
Standards
and
Instructional
Strategies**

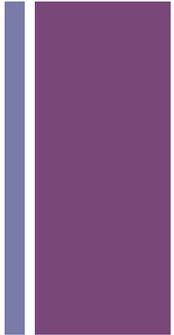


INVEST

Educator Preparation Conference

Lipscomb University

Introductions



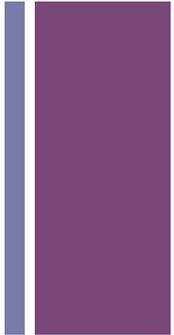
- Emily Medlock

Assistant Professor, Lipscomb University

- David Williams

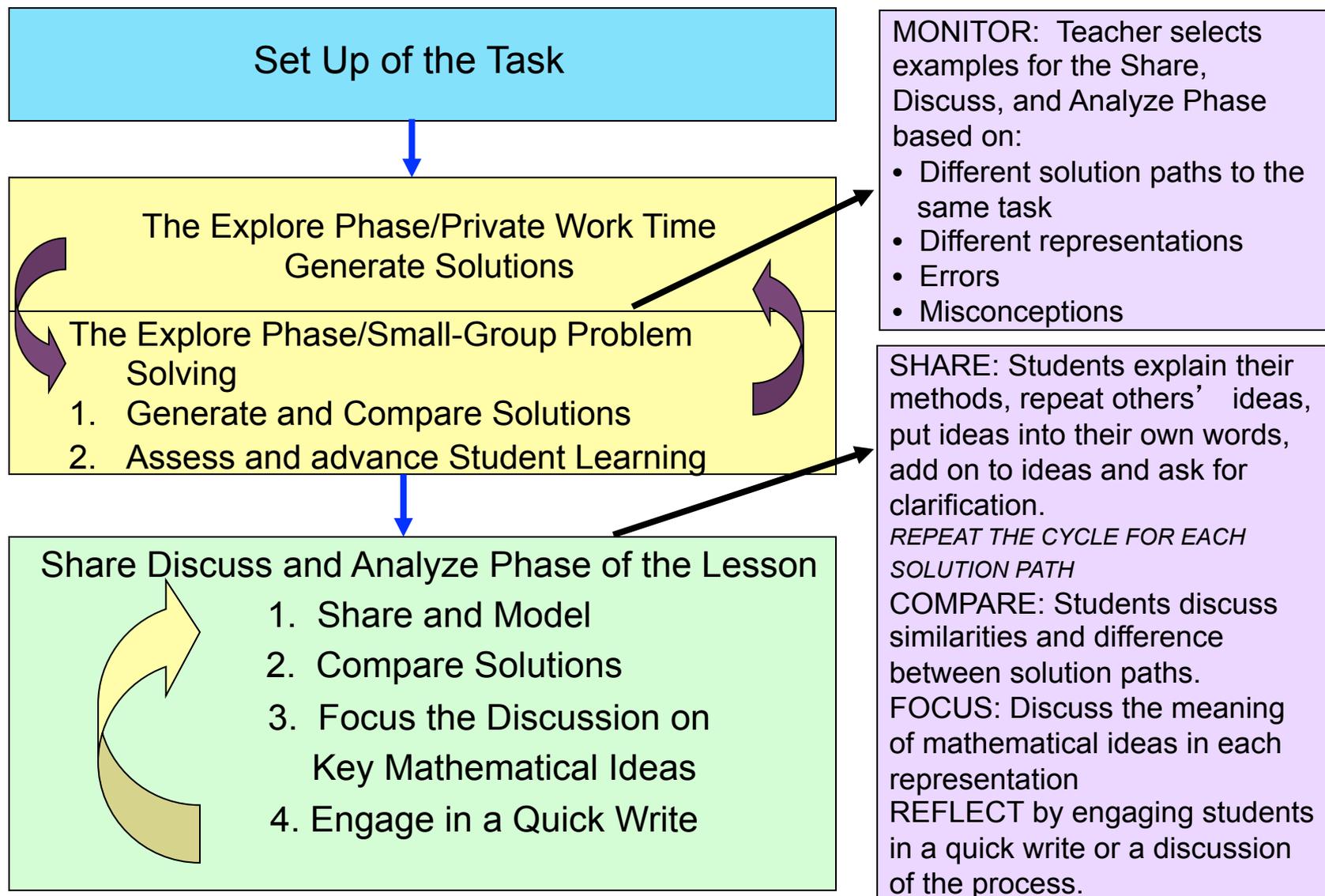
Mathematics Coordinator, TDOE

Math Practice Standards and Instructional Strategies



The Common Core State Standards have transformed the ways that teachers are learning to teach mathematics. In this session, participants will examine practical instructional strategies to use with pre-service teachers. An emphasis will be placed on the intentional use of the Standards for Mathematical Practice in planning, instruction, and assessment. The Mathematics Teaching Practices from Principles to Actions by the National Council of Teachers of Mathematics will also be discussed.

Structures and Routines of a Lesson



Place Value Game

Raven and Connor are playing a place value game. To play the game, they draw eight number cards then use the numbers to fill in the grid below:

<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>

They can then either add or subtract the two numbers they have formed using the number cards. On this particular round, they drew the following number cards:

<input type="text" value="7"/>	<input type="text" value="4"/>	<input type="text" value="2"/>	<input type="text" value="5"/>	<input type="text" value="3"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="3"/>
--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------------

- How should Raven and Connor arrange their cards so that the sum of the two numbers is as large as possible? What strategy should they use to arrange their cards? Is there more than one way to do this?
- How should Raven and Connor arrange their cards so that the sum of the two numbers is as small as possible? What strategy should they use to arrange their cards? Is there more than one way to do this?
- How should Raven and Connor arrange their cards so that the difference of the two numbers is as large as possible? What strategy should they use to arrange their cards? Is there more than one way to do this?

- Place Value Game

- Small Group Problem Solving
- Group Discussion

- What do you believe are the mathematical goals of this lesson?

Student A

$$\begin{array}{ccccccc} \boxed{3} & \boxed{3} & . & \boxed{5} & \boxed{8} & & \\ \boxed{2} & \boxed{4} & . & \boxed{7} & \boxed{9} & & \end{array}$$

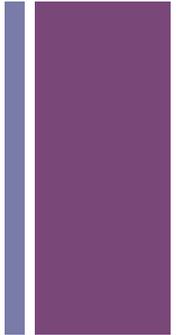
Student B

$$\begin{array}{ccccccc} 9 & 8 & . & 7 & 5 \\ 4 & 3 & . & 3 & 2 \end{array}$$

Student C

$$\begin{array}{cccc} 9 & 7 & . & 4 & 3 \\ 5 & 8 & . & 3 & 2 \end{array}$$

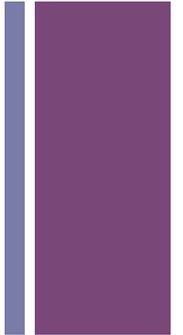
Pose Purposeful Questions



Based on your goal and the student work:

- Write 2 questions that assess student thinking.
- Write 2 questions that advance students toward the goal.

Characteristics of Questions that Support Students' Exploration



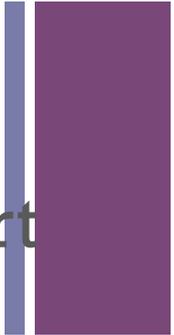
Assessing Questions

- Based closely on the work the student has produced.
- Clarify what the student has done and what the student understands about what s/he has done.
- Provide information to the teacher about what the student understands.

Advancing Questions

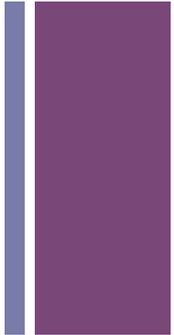
- Use what students have produced as a basis for making progress toward the target goal.
- Move students beyond their current thinking by pressing students to extend what they know to a new situation.
- Press students to think about something they are not currently thinking about.

Effective Teaching



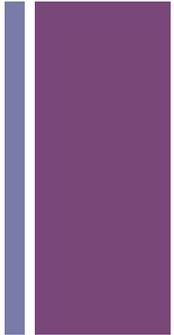
Effective teaching requires being able to support students as they work on challenging tasks without taking over the process of thinking for them (NCTM, 2000). Asking questions that assess student understanding of mathematical ideas, strategies or representations provides teachers with insights into what students know and can do. The insights gained from these questions prepare teachers to then ask questions that *advance* student understanding of mathematical concepts, strategies or connections between representations.

Standards for Mathematical Practice



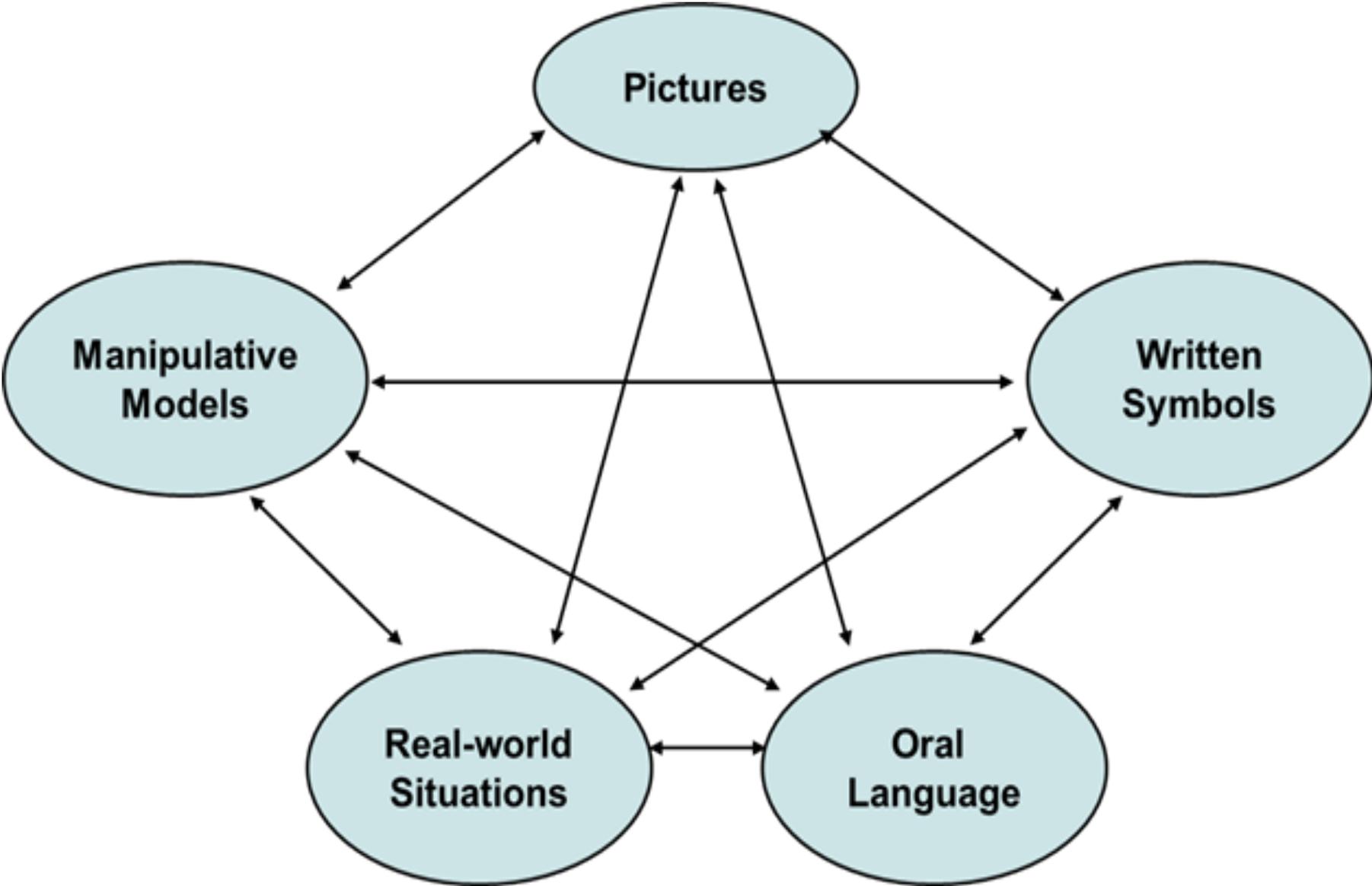
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look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

NCTM: Principles to Actions

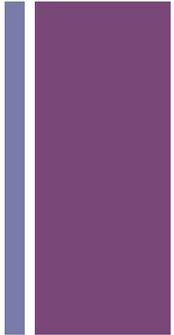


- Establish mathematics goals to focus learning
- Implement tasks that promote reasoning and problem solving
- Use and connect mathematical representations
- Facilitate meaningful mathematical discourse
- Pose purposeful questions
- Build procedural fluency from conceptual understanding
- Support productive struggle in learning mathematics
- Elicit and use evidence of student thinking

(NCTM, 2014)



Facilitating Meaningful Discourse



Using the handout provided, discuss ways that teachers can facilitate meaningful discourse in the mathematics classroom.

- Identify two moves teachers tend to do well and explain why.
- Identify two moves teachers find challenging and explain why.

Resources

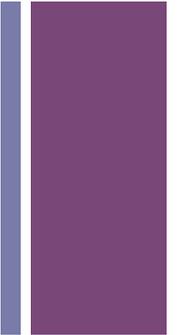
■ www.tncore.org

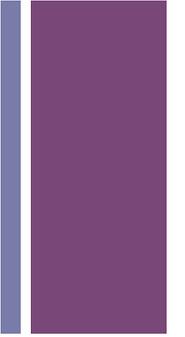
Username: tneducation

Password: fastestimproving

www.achievethecore.org

www.illustrativemathematics.org





Questions?