



Math and ELA FELLOWS

February 23, 2015
ESD 189

Invisibilia-Expectations Growth Mindset



Growth Mindset

- How do expectations impact our work with students?
- With our colleagues?
- With our own belief system?

Topics for Today

- Multiple Representations-Math Task
- CSTP Leadership-Systems Thinking
- Math Tasks: Higher and lower levels of Cognitive Demands
- SBAC-Claims and DOK Levels-sample items

Lunch from 11:30-12:30

Post Test Spring after Significant Instruction

Considerati
for Teachi
20 minute

Post-Test Content Cluster Rubric Scores—Grade Level _____

Score	1	2	3	4
Number of Students				

SBAC Achievement Level Descriptors Rubric Score—Standard for Mathematical Practice # _____

Score	1	2	3	4
Number of Students				

Implications for Teaching

What patterns did you observe about your students' work as a whole?

Was there improvement in your students' scores? Why? Or Why not?

Module 3 – Systems Thinking

CSTP

Center for Strengthening the Teaching
Profession

Module 3 – Systems Thinking Objectives

- Reflect on your results from the TL Framework Self-Assessment
- Know and understand your role in the system
- Develop and refine a message about WA State Learning Standards that you can share with your stakeholders
- Connect systems learning to your Fellows' plan

Systems Thinking

- Review your results from the Teacher Leadership Framework Self-Assessment:
 - What did you notice about how you assessed yourself in Systems Thinking?
 - Would you give yourself the same rating now? Why or why not?
 - What do you need to grow your capacity in this area? What makes you say that?
 - What does your system look like? Who are the people/organizations/entities involved?

Systems Thinking: Visualizing the System

Using chart paper, create a visual of what the system in which you are working as a fellow looks like. You may include as many labels and symbols but try for images over words. Please make special indications of the following:

- Mark with an “X” where you ‘reside’ in the system.
- Mark with a “\$” where there is funding and where it goes (if you know this)
- Mark or write with a “*” who you feel has the ability to influence decisions
- Mark with a “^” where you think you have influence in the system

Systems Thinking: Visualizing the System

Consider the pictures of the systems you saw – discuss the following questions with a partner:

- Are the individuals/ groups who have access to funding the same as those who make the decisions?
- Are the hierarchies represented established by formal means or have they developed informally?
- Are the layers of the system perceived or real?
- Who are your allies in this work?
- Who do you need to turn into your allies?
- What part of the system/organization does you plan focus on?

Card-Sort-Connections

- Take the note-cards you just filled out and spread them out.
- Each Fellow takes a card and explains how the card relates to his/her plan.
- As a table group, sort the cards into categories that make sense – be prepared to share out your category titles.

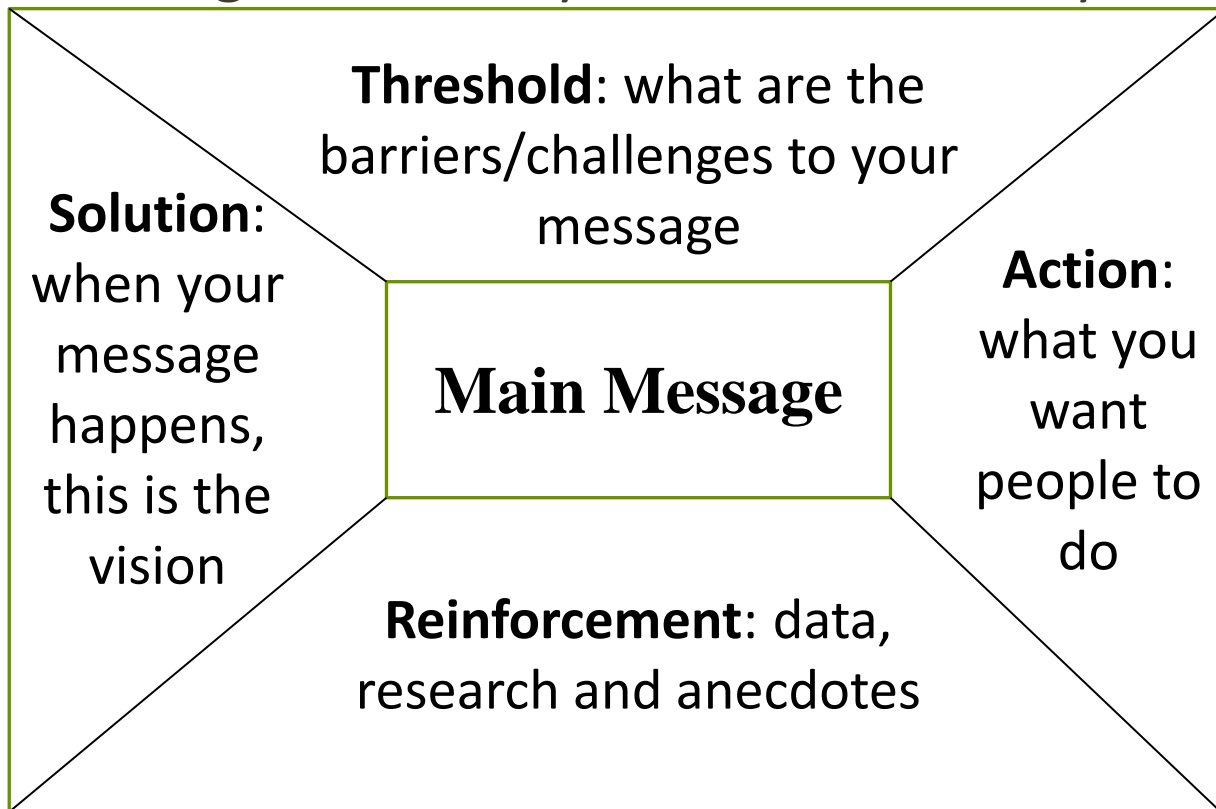
Reflections

As a table group, discuss the following reflective questions about Fellows' plans:

- Were you able to facilitate the learning as planned? Why or why not?
- For your next PL opportunity, who might be additional individuals who can support your efforts (your allies)
- What are next logical steps that will help enable your work with adult learners?
- Do you feel you are viewed as a leader in your system? If so, how can you leverage this? If not, who in the system can help promote you as a leader?

Systems Thinking: Messaging

The Message Development Box and Template is a graphic organizer used to capture pieces of information that can be used to **message** to a variety of audiences in a system.



Systems Thinking: Messaging

Fill out the messaging template.

- Main Message: Write the main crux of what you want people in your system to know/do.
- 4 parts: Fill out the supporting details and info used to strengthen your main message.
- Audience: In the margins of your template, brainstorm the people/group who needs to hear your message. Given where the people/group are on your systems chart, consider and highlight the supporting details important to these people/group and what you most need them to know.

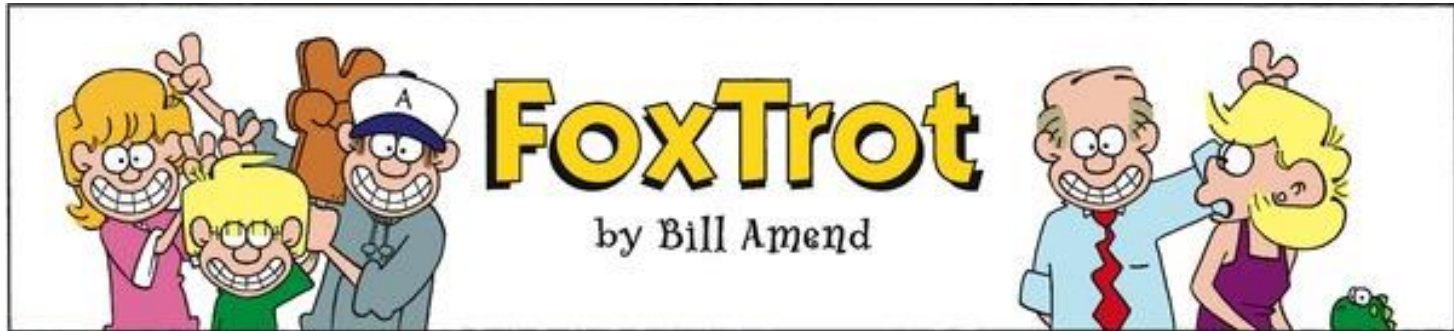
Systems Reflection

- What are you now thinking about systems that you weren't before?
- Do you feel you are viewed as a leader in your system? If so, how can you leverage this? If not, who in the system can help promote you as a leader?
- How did engaging in this activity help you think about your work as a fellow?
 - Where does it fit?
 - Where doesn't it?
- What are your next steps with your message?

Fellows Plan Reflection

In small groups discuss the following questions:

- What has been your message when meeting with your admin about the Fellows Plan?
- Who has the key leverage in your district/system around CCSS implementation?
- Who are one or two individuals you would like to share the vision of the Fellows and your work as a Fellow?
- What steps will you take to try and make this happen?
- How can your Coordinator help you in this?



Leadership of Self and Others

Connecting to your own context

To deprivatize our practice and take risks in order to facilitate high quality mathematics instruction and experiences students have with the mathematics. –Leadership of Self

To be a part of a community of learners that focuses on putting the shifts into practice to reflect the CCSS vision both around the student making sense of the mathematics and demonstrating that understanding

–Leadership of Others and Self



Teaching Practices that Support Common Core Implementation

- Establish Mathematics Goals to Focus Learning
- Implementing 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

Implementing Tasks



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Mathematic Teaching Practices: Implement tasks that promote reasoning and problem solving

<p>High-Level Tasks ~5-10 min</p>	<p>Principles to Actions (p. 17-24) <i>Implement Tasks That Promote Reasoning and Problem Solving</i></p> <p>Reflect on the tasks highlighted in the section above. Jot down your thoughts on the following questions:</p> <ul style="list-style-type: none"> • What are the characteristics of a task that places a high-level cognitive demand on students? • How could you take a low-level task and increase its cognitive demand? • What types of questions could you ask, or what types of moves could you make, to support students who struggle to get started on a problem-solving task, without diminishing the cognitive demand of that task?
<p>Share out ~15-20 min</p>	<p>Groups of 2-3 Partner/Group Share Out</p> <ul style="list-style-type: none"> • Take the first question from above and have a group go-around and repeat for question.
<p>Productive and Unproductive Beliefs ~10-15 min</p>	<p>Review the "Beliefs about teaching and learning mathematics" chart (p. 11, Obstacles) Consider the following questions:</p> <ul style="list-style-type: none"> • What impact do those beliefs have on students' opportunities for reasoning and problem solving in the lesson? <p>As a group of 2-3, be prepared to address the whole group with your thoughts on "What supports do our teachers need from us so that their mathematics classrooms can support student reasoning and problem solving?"</p>
<p>Task Sort Activity ~25 min</p>	<p>SBAC Practice Items</p> <ul style="list-style-type: none"> • In groups of 2 to 3, sort the SBAC practice items using the Levels of Demand on p. 18 • Discuss in your group what you notice or what you wonder • As a larger group, list (on chart paper) what you see as implications for instruction in the classroom
<p>Productive</p>	<p>Principles to Actions (p. 24-29) Review the "Beliefs about teaching and learning mathematics" chart (p. 11, Obstacles)</p>

Implementing Tasks to Promote Reasoning and Problem Solving

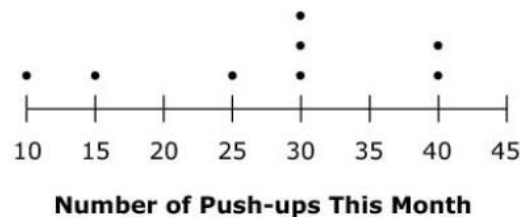
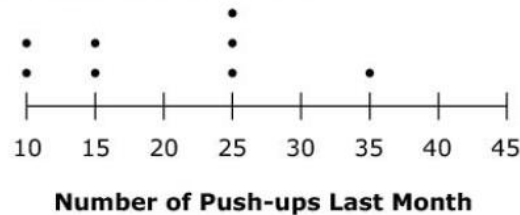
- In groups of 2 to 3, sort the SBAC practice items using the Levels of Demand on p. 18
- Discuss in your group what you notice or what you wonder

1880



Mr. Anthony wants to know how some student athletes are improving in the number of push-ups they can do.

These dot plots show the number of push-ups each student was able to do last month and this month.



What is the increase in the mean number of push-ups from last month to this month?

Claims for the Mathematics Summative Assessment

Overall Claim for Grades 3-8

"Students can demonstrate progress toward college and career readiness in mathematics."

Overall Claim for Grade 11

"Students can demonstrate college and career readiness in mathematics."

Claim #1 - Concepts & Procedures

"Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency."

Claim #2 - Problem Solving

"Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies."

Claim #3 - Communicating Reasoning

"Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others."

Claim #4 - Modeling and Data Analysis

"Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems."

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.

1986



A pencil has a mass of 25 grams. An apple has a mass that is 75 grams more than the pencil.

What is the mass of the apple, in grams?

←	→	↶	↷	✖
1	2	3		
4	5	6		
7	8	9		
0	.	$\frac{\square}{\square}$		

Claim 1
Concepts and
Procedures

Claim 2
Problem Solving

Claim 3
Communicating
Reasoning

Claim 4
Modeling and Data
Analysis

1988



Does replacing the unknown number with 7 make each equation true?
Select Yes or No for each equation.

	Yes	No
$6 \times \square = 36$	<input type="checkbox"/>	<input type="checkbox"/>
$8 \times \square = 64$	<input type="checkbox"/>	<input type="checkbox"/>
$49 \div \square = 7$	<input type="checkbox"/>	<input type="checkbox"/>
$54 \div \square = 6$	<input type="checkbox"/>	<input type="checkbox"/>

Claim 1
Concepts and
Procedures

Claim 2
Problem Solving

Claim 3
Communicating
Reasoning

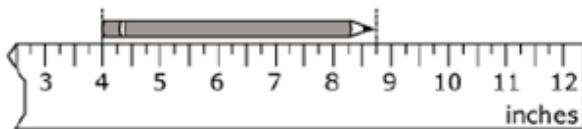
Claim 4
Modeling and Data
Analysis

2024



Tracy has a broken ruler, but she can use it to measure the length of her pencil.

What is the length, in inches, of the pencil shown?



- (A) 8 inches
- (B) $7\frac{3}{4}$ inches
- (C) 5 inches
- (D) $4\frac{3}{4}$ inches

Claim 1
Concepts and
Procedures

Claim 2
Problem Solving

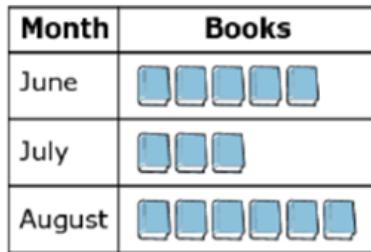
Claim 3
Communicating
Reasoning


Claim 4
Modeling and Data
Analysis



Marcia read books over the summer. She created the picture graph shown.

Summer Reading



 = 2 books

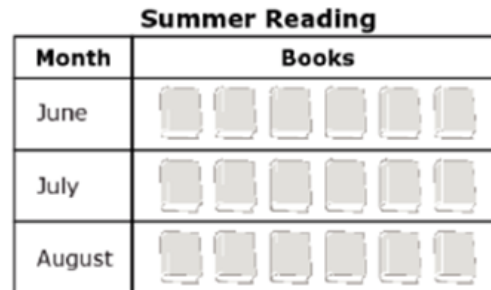
Create another picture graph that shows these data with a different key. You may use whole books and half books in your graph.

- Select the key you will use.
- Select books to complete your picture graph.

A. Select the key you will use.

 = 3 books  = 4 books  = 5 books  = 6 books

B. New picture graph



Claim 1
Concepts and
Procedures

Claim 2
Problem Solving

Claim 3
Communicating
Reasoning

Claim 4
Modeling and Data
Analysis

Hess' Cognitive Rigor Matrix & Curricular Examples: Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions – *M-Sci*

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/ Reasoning	Webb's DOK Level 4 Extended Thinking
<p>Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify</p>	<ul style="list-style-type: none"> Recall, observe, & recognize facts, principles, properties Recall/ identify conversions among representations or numbers (e.g., customary and metric measures) 			
<p>Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion (such as from examples given), predict, compare/contrast, match like ideas, explain, construct models</p>	<ul style="list-style-type: none"> Evaluate an expression Locate points on a grid or number on number line Solve a one-step problem Represent math relationships in words, pictures, or symbols Read, write, compare decimals in scientific notation 	<ul style="list-style-type: none"> Specify and explain relationships (e.g., non-examples/examples; cause-effect) Make and record observations Explain steps followed Summarize results or concepts Make basic inferences or logical predictions from data/observations Use models /diagrams to represent or explain mathematical concepts Make and explain estimates 	<ul style="list-style-type: none"> Use concepts to solve <u>non-routine</u> problems Explain, generalize, or connect ideas <u>using supporting evidence</u> Make <u>and justify</u> conjectures Explain thinking when more than one response is possible Explain phenomena in terms of concepts 	<ul style="list-style-type: none"> Relate mathematical or scientific concepts to other content areas, other domains, or other concepts Develop generalizations of the results obtained and the strategies used (from investigation or readings) and apply them to new problem situations
<p>Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task</p>	<ul style="list-style-type: none"> Follow simple procedures (recipe-type directions) Calculate, measure, apply a rule (e.g., rounding) Apply algorithm or formula (e.g., area, perimeter) Solve linear equations Make conversions among representations or numbers, or within and between customary and metric measures 	<ul style="list-style-type: none"> Select a procedure according to criteria and perform it Solve routine problem applying multiple concepts or decision points Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table) Construct models given criteria 	<ul style="list-style-type: none"> Design investigation for a specific purpose or research question Conduct a designed investigation Use concepts to solve non-routine problems <u>Use & show reasoning, planning, and evidence</u> Translate between problem & symbolic notation when not a direct translation 	<ul style="list-style-type: none"> Select or devise approach among many alternatives to solve a problem Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
<p>Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct</p>	<ul style="list-style-type: none"> Retrieve information from a table or graph to answer a question Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram) Identify a pattern/trend 	<ul style="list-style-type: none"> Categorize, classify materials, data, figures based on characteristics Organize or order data Compare/ contrast figures or data Select appropriate graph and organize & display data Interpret data from a simple graph Extend a pattern 	<ul style="list-style-type: none"> Compare information within or across data sets or texts Analyze and <u>draw conclusions from data, citing evidence</u> Generalize a pattern Interpret data from complex graph Analyze similarities/differences between procedures or solutions 	<ul style="list-style-type: none"> Analyze multiple sources of evidence analyze complex/abstract themes Gather, analyze, and evaluate information

2025



A teacher gives 6 students some cards to play a game. She has 52 cards total. The teacher gives each student 1 card until all 52 cards are gone.

How many students get exactly 9 cards?

- (A) 2
- (B) 4
- (C) 5
- (D) 6

DOK 1
Recall and
Reproduction

DOK 2
Skills and Concepts

DOK 3
Strategic Thinking
and Reasoning

DOK 4
Extended Thinking

2045



A bottle holds $\frac{3}{5}$ liter of water. Sam needs 8 full bottles of water to fill his fish tank. How many liters of water does Sam need to fill the fish tank?

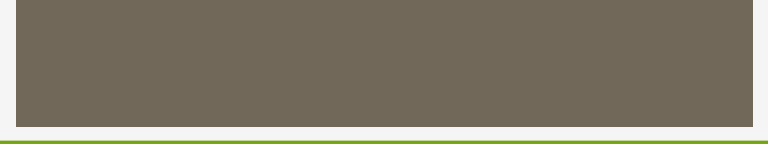
- (A) $2\frac{1}{5}$
- (B) $4\frac{4}{5}$
- (C) $7\frac{2}{5}$
- (D) $8\frac{3}{5}$

DOK 1
Recall and
Reproduction

DOK 2
Skills and Concepts

DOK 3
Strategic Thinking
and Reasoning

DOK 4
Extended Thinking



DOK 1
Recall and
Reproduction

DOK 2
Skills and Concepts





DOK 3
Strategic Thinking
and Reasoning

DOK 4
Extended Thinking

1891



Which fraction model best represents $4 \times \frac{2}{3}$?

- (A) 
- (B) 
- (C) 
- (D) 

DOK 1

Recall and
Reproduction

DOK 2

Skills and Concepts

DOK 3

Strategic Thinking
and Reasoning

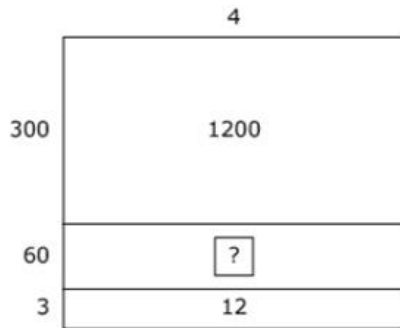
DOK 4

Extended Thinking

1890



Jasmine solves the equation $\square \div 4 = 363$ using this area model.



Which statement explains how Jasmine should solve for the missing number in the model?

- (A) Jasmine should divide 60 by 4.
- (B) Jasmine should divide 1200 by 12.
- (C) Jasmine should multiply 3 times 60.
- (D) Jasmine should multiply 4 times 60.

DOK 1
Recall and
Reproduction

DOK 2
Skills and Concepts

DOK 3
Strategic Thinking
and Reasoning

DOK 4
Extended Thinking

Implementing Tasks to Promote Reasoning and Problem Solving

Consider the reading from Principals to Actions: pg 17-24

Individually jot down your thoughts on the following questions:

- What are the characteristics of a task that places a high-level cognitive demand on students?
- How could you take a low-level task and increase its cognitive demand?
- What types of questions could you ask, or what types of moves could you make, to support students who struggle to get started on a problem-solving task, without diminishing the cognitive demand of that task?

Implementing Tasks to Promote Reasoning and Problem Solving

In groups of 2-3 Partner/Group Share Out

- Take the first question from above and have a group go-around and repeat for each question.

Implementing Tasks to Promote Reasoning and Problem Solving

Review the “Beliefs about teaching and learning mathematics” chart (p. 11, Obstacles) Consider the following questions:

- What impact do those beliefs have on students’ opportunities for reasoning and problem solving in the lesson?
- As a group of 2-3, be prepared to address the whole group with your thoughts on “What supports do our teachers need from us so that their mathematics’ classrooms can support student reasoning and problem solving?”

Implementing Tasks to Promote Reasoning and Problem Solving

SBAC Practice Items

- In groups of 2 to 3, sort the SBAC practice items using the Levels of Demand on p. 18
- Discuss in your group what you notice or what you wonder
- As a larger group, list (on chart paper) what you see as implications for instruction in the classroom

Use and Connect Mathematical Representations

In groups of 2-4:

Skim/Scan section on Principles to Actions on
pg 24 - 29

- Pick a phrase or a sentence that captures an important idea for you in this section
- Use sticky note to record your thinking and be ready to share out with the group how teachers might respond to your quote

Discussion Protocol

A round consists of:

One person – the “original speaker” – uses up to 1 minute to:

- Read aloud the passage selected
- Original speaker says what he/she thinks about the passage (interpretation, connection or implication to our work)

Group participants respond to what has been said for up to 3 minutes

- The original speaker has 1 minute for the final word: either summarizing what was said or describing new thinking based on group discussion
- Repeat process so all participants share their passage

Use and Connect Mathematical Representations

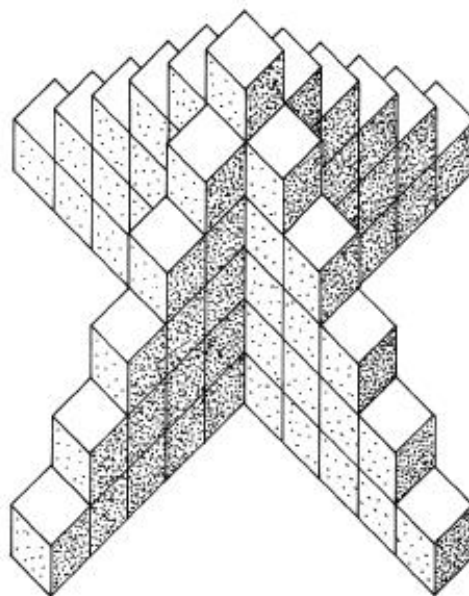
Revisit a task from the task sort

- Individually, show how students might solve each problem by using different representations.
- Discuss the relationships among all the representations generated for each problem with members of your group

Use and Connect Mathematical Representations

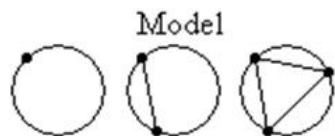
- Review the “Beliefs about teaching and learning mathematics” chart (p. 11, Obstacles)
- How do those beliefs support students in making connections among different representations of the problem?

Skeleton Tower



1. How many cubes are needed to build this tower?
Show your calculations

2. How many cubes are needed to build a tower like this, but 12 cubes high?
Explain how you figure out your answer.



Rule
Symbolic Expression

$$L = 0 + 1 + 2 + 3 + \dots + (n - 1)$$

$$L = \frac{(n-1)n}{2}$$

Recursive Equations

$$L_1 = 0$$

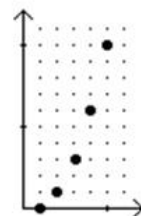
$$L_n = L_{n-1} + n - 1$$

Functions

Table of Numerical Values

$n = \#$ of points	$L = \#$ of line segments
1	0
2	1
3	3
4	6
5	10

Graph



Context

Real World Connections and Stories

If n points drawn on a circle, what is the maximum number of line segments L that connects them?

Review of Interim Assessments

View the interim assessments in your grade band

- In teams of two select an item(s) that requires teacher to engage students in high-level tasks or in making connections between mathematical representations
- Determine how high-level tasks and the use and connection of mathematical representations will support students on the Interim Assessments and/or as they prepare for the SBAC

● What professional development do we need

For Next Time...

- Principals to Actions: (p. 29-41)
Facilitate Meaningful Mathematical Discourse and Pose Purposeful Questions
- Meet with building and/or district administrator to review/revisit Professional Learning Plan
- Administer and score tasks (same as baseline)

Prior to next meeting