Math Leadership Network

NWESD

June 4, 2015

Norms

1. Promoting a Spirit of Inquiry
2. Pausing
3. Paraphrasing
4. Probing
5. Putting Ideas on the Table
6. Paying Attention to self and Others
7. Presuming Positive Intentions

Pair Products

- Choose four consecutive whole numbers.
- Multiply the first and last numbers together.
- Multiply the middle pair together.
- Choose several different sets of four consecutive whole numbers and do the same.
- What do you notice? Can you explain what you have noticed? Will it always happen?

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Topics for Today

- Fundamentals of Learning
- Principals to Actions
- High Demand Tasks
- Multiple Representations-Math Task
- Lunch from 11:30-12:30
- Looking at Post Assessment Data
- Break out in Grade Level Bands…Most Important Thing
- Discussion Groups
- Evaluations, Clock Hours,

Learning Targets:

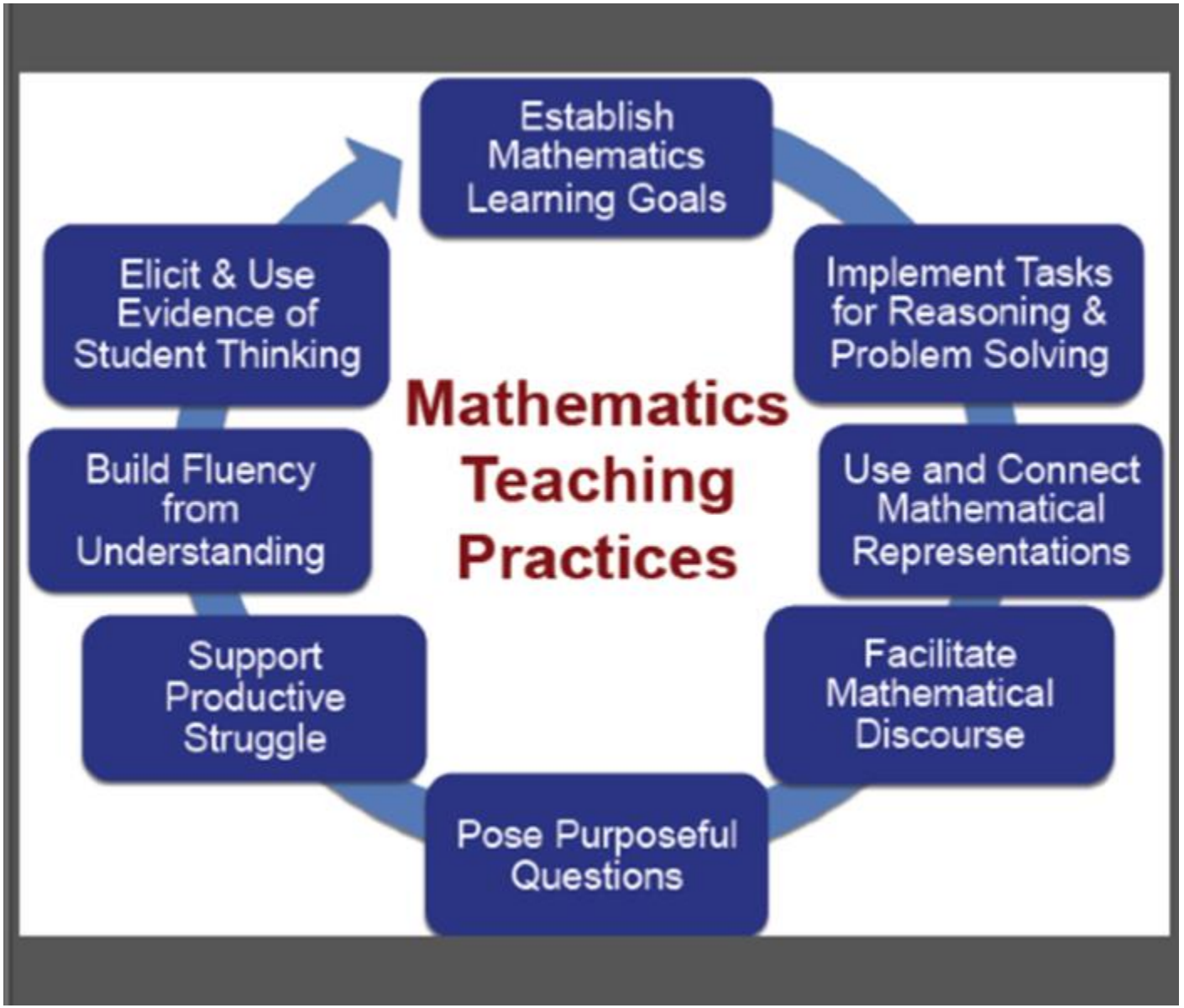
We will:

- increase our leadership capacity as we grow in our understanding of the the Washington State Learning Standards
- continue to deepen our mathematical understanding of mathematic teaching practices

Success Criteria:

- We will share with our colleagues the use of high level tasks and multiple representations for our planning in the 2014-2015 school year

Implementing Tasks


Establish Mathematics Learning Goals
Implement Tasks for Reasoning & Problem Solving
Use and Connect Mathematical Representations
Facilitate Mathematical Discourse
Pose Purposeful Questions
Support Productive Struggle
Build Fluency from Understanding
Elicit & Use Evidence of Student Thinking
Mathematics Teaching Practices

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 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

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?

Model

Rule

Symbolic Expression

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

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

Recursive Equations

$$L_1 = 0$$

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

Functions

Graph

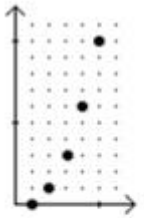


Table of Numerical Values

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

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?

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."

Claim 1

- This claim addresses procedural skills and the conceptual understanding on which developing skills depend.
- Item specifications document uses the cluster headings as the targets of assessment for generating evidence for Claim #1

A cubical block of metal weighs 6.4 x 106 pounds. How much will another cube of the same metal weigh if its sides are half as long?

Claim 2

- Problems that include a layer of related concepts and standards
- Can be solved using different strategies
- Solution path is not immediately obvious

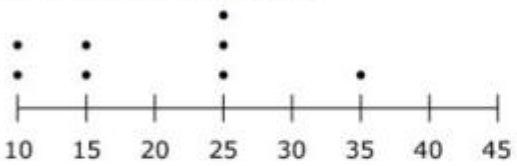
Implementing Tasks to Promote Reasoning and Problem Solving

- 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

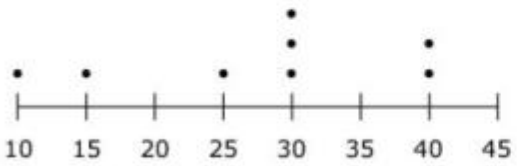
1880

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.



Number of Push-ups Last Month



Number of Push-ups This Month

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

Claim 3

- Items will typically present a proposed solution to a problem or the beginning of a generalization and ask students to provide a justification, explanation or a counter-example

- Students will have to demonstrate proficiency and rigor in their reasoning (conceptual understanding, fluency, application)

Claim 3

Claim #3 Assessment Targets
Target A: Test propositions or conjectures with specific examples.

Target B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.

Target D: Use the technique of breaking an argument into cases.

Target E: Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument, explain what it is.

Sale prices

Max bought 2 items in a sale.

One item was 10% off.

One item was 20% off.

Max says he saved 15% altogether. Is he right? Explain.

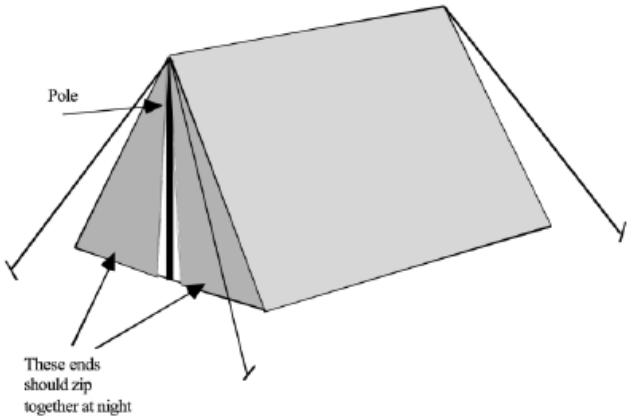
Claim 4

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

- “Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decision-making.” (p.72, CCSSM)

Claim 4

Design a Tent (Grade 8)



Your task is to design a 2-person tent like the one in the picture.

Your design must satisfy these conditions:

- It must be big enough for someone to move around in while kneeling down, and big enough for all their stuff.
- The bottom of the tent will be made from a thick rectangle of plastic.
- The sloping sides and the two ends will be made from a single, large sheet of material.
- Two vertical tent poles will hold the whole tent up.

Make drawings to show how you will cut the plastic and the material.

Make sure you show the measures of all relevant lengths and angles clearly on your drawings, and explain why you have made the choices you have made.

Depth of Knowledge

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
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	○ Recall, observe, & recognize facts, principles, properties ○ Recall/ identify conversions among representations or numbers (e.g., customary and metric measures)			
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	○ 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	○ 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	○ Use concepts to solve non-routine problems ○ Explain, generalize, or connect ideas using supporting evidence ○ Make and justify conjectures ○ Explain thinking when more than one response is possible ○ Explain phenomena in terms of concepts	○ 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
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	○ 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	○ 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	○ Design investigation for a specific purpose or research question ○ Conduct a designed investigation ○ Use concepts to solve non-routine problems ○ Use & show reasoning, planning, and evidence ○ Translate between problem & symbolic notation when not a direct translation	○ 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
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	○ 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	○ 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	○ Compare information within or across data sets or texts ○ Analyze and draw conclusions from data, citing evidence ○ Generalize a pattern ○ Interpret data from complex graph ○ Analyze similarities/differences between procedures or solutions	○ Analyze multiple sources of evidence ○ analyze complex/abstract themes ○ Gather, analyze, and evaluate information

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?

Learning Targets:

We will:

- Increase our leadership capacity as we grow in our understanding of the the Washington State Learning Standards
- Continue to deepen our mathematical understanding of mathematic teaching practices

Success Criteria:

- We will take back our enthusiasm around mathematics and share with our colleagues a mathematical practice in which we are deepening our understanding

NWESD MSP SURVEY

http://bit.ly/nwesd_msp