RAMP-A

January 11, 2013

- Revisit norms and develop a sense of community,
- Gain a deeper understanding of the focus and coherence of the CCSS-M,
- Consider ways to implement a rich task for a specific purpose and at cognitive complexity Level 3, and use SMP 2, 7, and 8,
- Envision possible teacher – principal conversations about an observed lesson that targets TPEP criterion 4,
- Expand and refine our understanding of the Algebra domain Seeing Structure in Expressions and how to teach it,
- Discuss how to motivate students to learn math, and
- Identify and commit to "Little Changes" for our PLC and ourselves.

Goals for the Day

- Know our intentions – use to guide actions.
- Maintain productive ways of listening, responding, and inquiring.
- Know when to be assertive (refocus, stay on task), when to integrate (attempt to understand others' viewpoints).
- Know and support the group purpose, process, development.

Revisiting the Norms

- Know our intentions – use to guide actions.
- **Maintain productive ways of listening, responding, and inquiring.**
- Know when to be assertive (refocus, stay on task), when to integrate (attempt to understand others' viewpoints).
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Using the Norms

- Pause
- Paraphrase
- Put inquiry at the center
- Probe for specificity
- Place ideas on the table
- Pay attention to self and otners
- Presume positive intent

Focusing on Communication

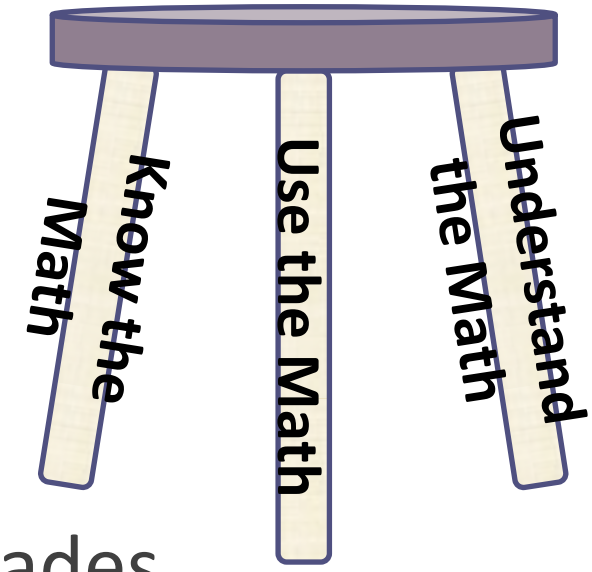
- Visit the Spinners problem. http://nrich.maths.org/6123

- In your groups, read and think about the Invisible Spinners problem individually.

- At the signal, one of you will be asked to share your thinking about the problem.
- Each other member of the group must paraphrase what the original speaker said or ask a probing (not leading!) question of the speaker.

Practicing the Norms

Mathematics



* **Focus** strongly where the Standards focus.
* **Coherence**: **Think** across grades, and **link** to major topics within grades.
* **Rigor**: In major topics pursue **conceptual understanding**, procedural skill and **fluency**, and **application** with equal intensity.

Changes in Our Practice

- Focus requires that we significantly narrow the scope of content in each grade so that students more deeply experience that which remains.

- Focus includes the concepts underlying mathematics, the skills of mathematics, and the ability to apply mathematics to solve problems and put the knowledge to engaging uses.

Focus

- Coherence is about making math making sense.
- The standards define progressions of learning that leverage these principles as they build knowledge over the grades. The standards were not so much assembled out of topics as woven out of progressions.
- The most important connections are vertical: the links from one grade to the next that allow students to progress in their mathematical education.
- The standards show how individual topics can be positioned in support of the major work of the grade.

coherence can support focus.

Coherence

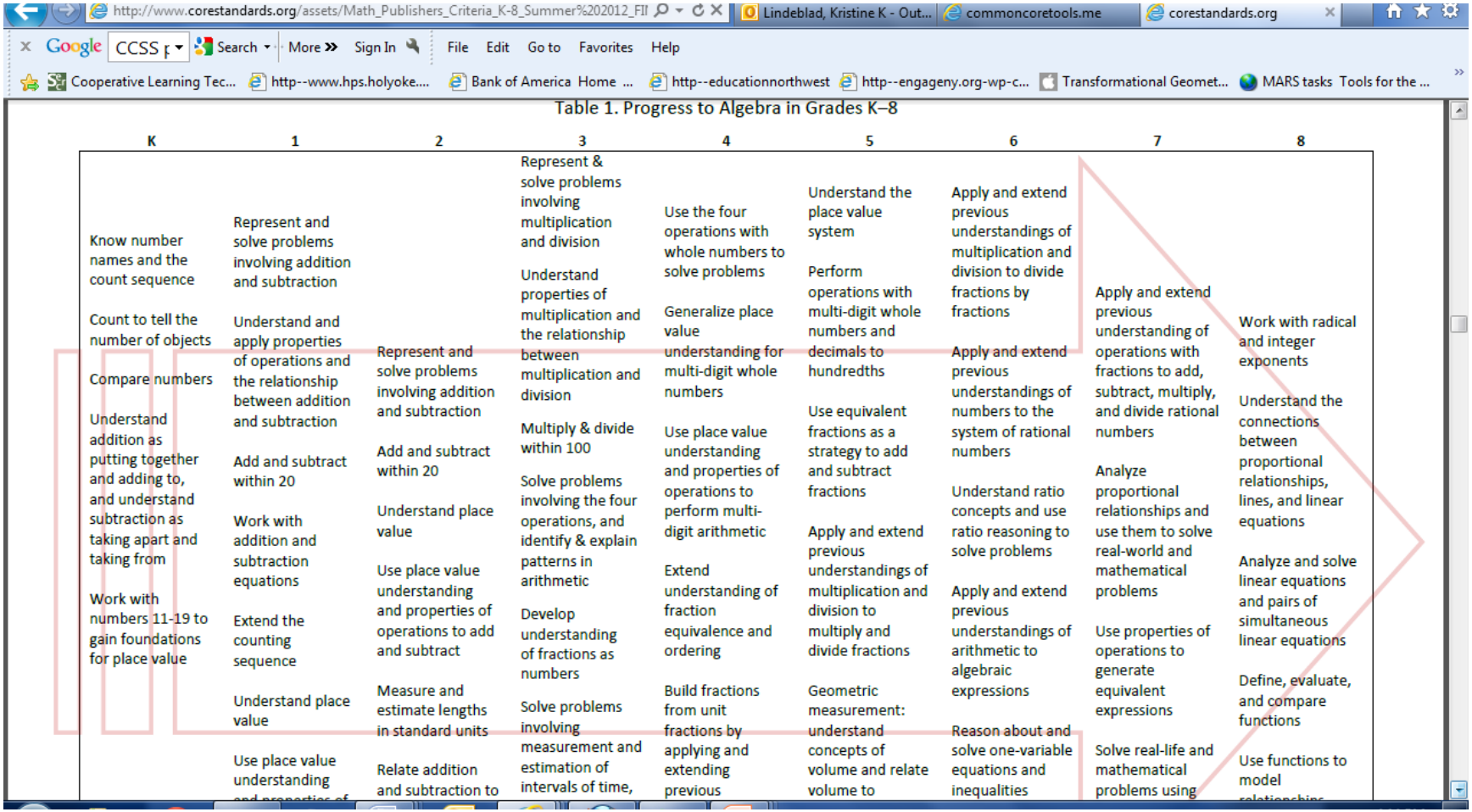


Table 1. Progress to Algebra in Grades K–8

K	1	2	3	4	5	6	7	8
Know number names and the count sequence Count to tell the number of objects Compare numbers Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from Work with numbers 11-19 to gain foundations for place value	Represent and solve problems involving addition and subtraction Understand and apply properties of operations and the relationship between addition and subtraction Add and subtract within 20 Work with addition and subtraction equations Extend the counting sequence Understand place value Use place value understanding	Represent and solve problems involving addition and subtraction Add and subtract within 20 Understand place value Use place value understanding and properties of operations to add and subtract Measure and estimate lengths in standard units Relate addition and subtraction to	Represent & solve problems involving multiplication and division Understand properties of multiplication and the relationship between multiplication and division Multiply & divide within 100 Solve problems involving the four operations, and identify & explain patterns in arithmetic Develop understanding of fractions as numbers Solve problems involving measurement and estimation of intervals of time,	Use the four operations with whole numbers to solve problems Generalize place value understanding for multi-digit whole numbers Use place value understanding and properties of operations to perform multi-digit arithmetic Extend understanding of fraction equivalence and ordering Build fractions from unit fractions by applying and extending previous	Understand the place value system Perform operations with multi-digit whole numbers and decimals to hundredths Use equivalent fractions as a strategy to add and subtract fractions Apply and extend previous understandings of multiplication and division to multiply and divide fractions Geometric measurement: understand concepts of volume and relate volume to	Apply and extend previous understandings of multiplication and division to divide fractions by fractions Apply and extend previous understandings of numbers to the system of rational numbers Understand ratio concepts and use ratio reasoning to solve problems Apply and extend previous understandings of arithmetic to algebraic expressions Reason about and solve one-variable equations and inequalities	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers Analyze proportional relationships and use them to solve real-world and mathematical problems Use properties of operations to generate equivalent expressions Solve real-life and mathematical problems using	Work with radical and integer exponents Understand the connections between proportional relationships, lines, and linear equations Analyze and solve linear equations and pairs of simultaneous linear equations Define, evaluate, and compare functions Use functions to model

Progressions

- http://www.corestandards.org/assets/Math_Publishers_Criteria_K-8_Summer%202012_FINAL.pdf

- http://commoncoretools.me/wp-content/uploads/2012/12/ccss_progression_algebra_2012_12_04.pdf

Good Resources

- Read and discuss the problems. In what would order could they be taught in order to support the learning of algebra?

- How do these problems support focus and coherence in the CCSS?

- What are the major mathematics that can be learned from these problems?

Algebraic Thinking About Coherence and Focus

- Consider how understanding of exponential growth and decay can be developed through a rich task.
- Consider how the task may be implemented at cognitive complexity Level 3.
- Reflect on opportunities for students to employ Standards for Mathematical Practices 2, 7, and 8 to learn content.
- Discuss evidence of TPEP Criterion 4.

Miguel and Anna Revisited

- **Level 3 (Strategic Thinking)** requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is a Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning.

Cognitive Complexity

- SMP2: Reason abstractly and quantitatively.
- SMP7: Look for and make use of structure.
- SMP8: Look for and express regularity in repeated reasoning.

Mathematical Practice

- CP3: Instruction is frequently consistent with **pedagogical content knowledge** and supports students in discipline-specific habits of thinking. (Proficient)
- Marzano: The teacher demonstrates a comprehensive knowledge of the subject and the standards for the subject. (Proficient)

TPEP (CEL)

- Some of the teacher evidence for Marzano: Appropriately uses content language
- Adjusts lesson based on content knowledge
- Connects content to the standards
- Develops appropriate formative/summative assessments/rubrics
- Engages in content discussions with colleagues

Teacher evidence for Marzano

- This knowledge is different from the knowledge of a mathematician and also different from the general pedagogical knowledge shared by teachers across disciplines.
- It includes knowledge of the representations, tools, and teaching strategies that support development of specific content knowledge, as well as understanding students' strategies, prior conceptions and potential misconceptions related to this content knowledge.

Pedagogical Content Knowledge

- F-BF.1a: Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
- 2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★
- F-LE.1: Distinguish between situations that can be modeled with linear functions and with exponential functions… Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- Interpret expressions that represent a quantity in terms of its context.★
  - Interpret parts of an expression, such as terms, factors, and coefficients.

CCSS-M Standards

Two possible purpose statements for my lesson:

- A: Students will be able to apply the ideas of exponential growth and decay to solve a problem.
- B: Students will reason abstractly and quantitatively about exponential situations to better understand the structure of exponential expressions.

Purpose of the Lesson

“Today we’re going to explore a situation to better understand the way quantities increase or decrease when they change by a constant percent each time period.

Think alone for a minute to come up with an example of a quantity you think could change by the same percent each time period. Then talk with your neighbor about your idea and his or her idea: do you think your neighbor has a good example? Why or why not? Be ready to share with the class.”

Lesson Launch

- What do you need from the people around you and the facilitator to feel comfortable doing a math task with others?

Recall Math Norms

- Miguel and his sister Anna each deposited the same amount of money into investments. Miguel's investment earned 5% per year, eventually doubling his original investment, at which time he withdrew all his money (principal and interest) from the investment. Unfortunately, Anna's investment lost 5% per year and she withdrew what was left when her original investment was cut in half. Who withdrew their money sooner? Show and explain your reasoning.

Miguel and Anna

- Look over your ‘noticings’ and ‘wonderings’: what big ideas arise for you?

- What questions would you ask the teacher?

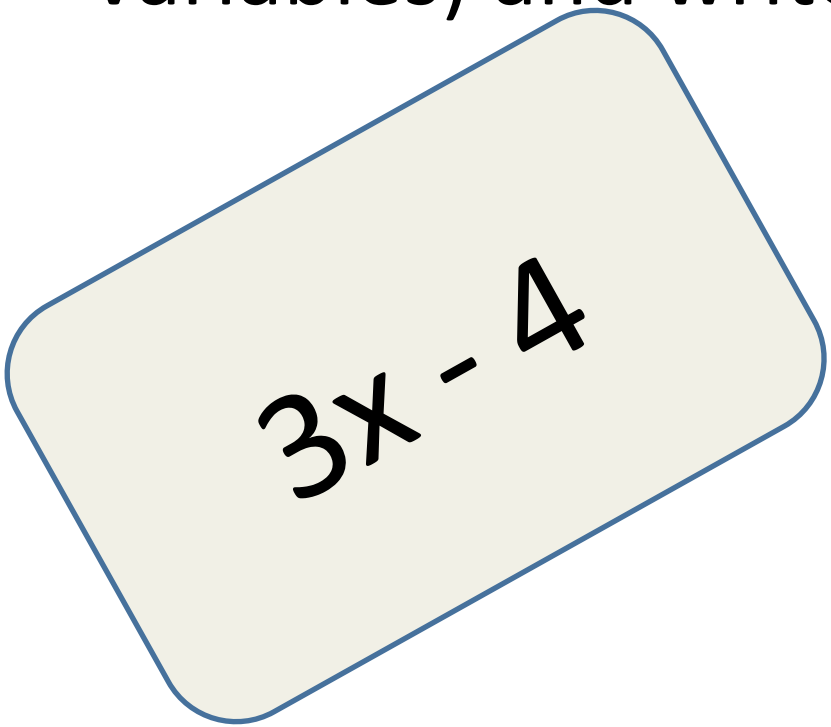
- What advice and feedback would you give to this teacher and her PLC? Why?

Reflection

Break!!

Regrouping

- Create a linear expression in x (no other variables) and write it on a 3 by 5 card.



- Three goals for this activity:
  - Develop a deeper understanding of the standards within this domain.
  - Describe pedagogical content knowledge for teaching A-SSE.
  - Create an assessment item to use in your classrooms that assesses a standard in this domain.

Seeing Structure in Expressions

- “Seeing structure in expressions entails a dynamic view of algebraic expression, in which potential rearrangements and manipulations are ever present” (p. 4 Progressions Algebra)

Purposeful Transformations, Not ‘Simplification’

- Look at the standards and brainstorm examples of problems and pedagogical content knowledge from:
  - Our discussions of A-SSE in the previous three workshops, and
  - The content you are currently teaching.
- How do the description of the domain and cluster statements provide more meaning?

A-SSE

- **F-IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  - a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
  - b. Use the properties of exponents to interpret expressions for exponential functions. For example, *identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*

Related Standards in CCSS

- Video http://commoncore.americaachieves.org/
  - A-SSE.2: Use the structure of an expression to identify ways to rewrite it
  - SMP 3: Construct viable arguments and critique the reasoning of others
  - SMP 7: Look for and make use of structure
- In what ways does this teacher target students' ways of seeing structure in expressions?

Example from Achieve

- What pedagogical content knowledge did the teacher use?
- What do you notice about students' thinking?
- What can you add to your examples?

Discuss

- Discuss and explain how the task addresses the standard, cluster, and domain.
- Discuss how you could use the task in your classrooms and how you could encourage student reasoning about the standard.
- Create a similar type question that you could use in your classrooms that targets your 'Focus' topic. You will collecting student work on this task.
- What new insights have you gained about the meaning of this standard and of ways to teach this standard?

A-SSE Tasks: Illustrative Mathematics Project

- Find others whose tasks are the same color as yours. Divide yourselves into three groups so that each group has each task represented.

Jigsaw

- Each person should share his or her original task and any insights he or she has about it or how to teach it.
- Each person should share the task created in his or her previous group.
- Group members should ask questions and anticipate students' responses.
- Turn in a copy of each task you created. These will be scanned and put on the Moodle.

Sharing tasks

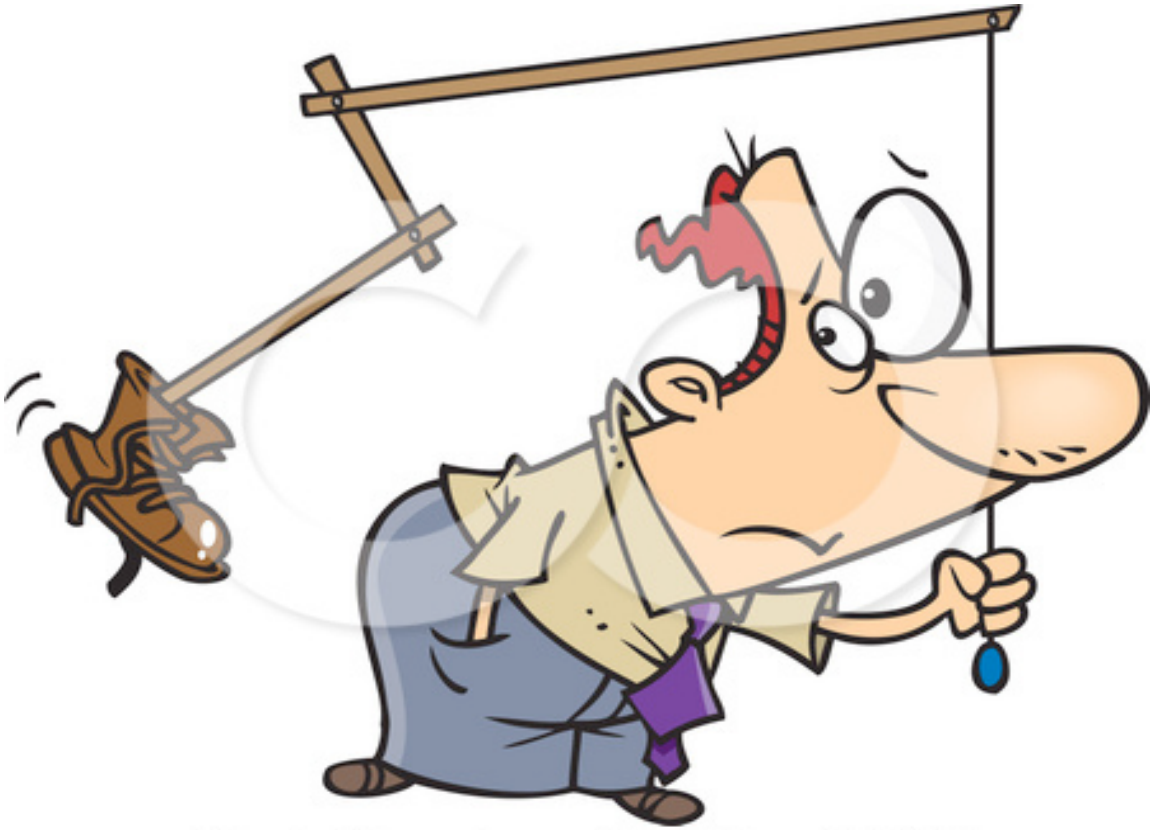
- Rate your understanding of A-SSE on a scale of 1-5
  - 1-I understand very little about this domain or how to teach it.
  - 5-I am very confident I know how to incorporate this standard into my current practice.
- What idea(s) regarding A-SSE are you most likely to try and why?

Reflection

- Order yourselves by the value of your linear expression when x=10.

- Remember to use your communication norms!

Lunch!!



Motivation to Learn Math

- Think about what you currently do to increase students' motivation to learn mathematics (think of at least one thing that you currently do, whether intentional or not, that you think encourages motivation to learn)
- What effects do your current practices have on students' motivation to learn? (consider environment, management, grading, and any other routines or classroom policies)
- Group recorder turns in notes.

Motivation to Learn Mathematics

- Please sit with your regular PLC

- Given your discussion about the shifts, Focus and Coherence, and Motivation, what Little Change could you focus on this year as you begin to implement the CCSS?
- Feel think about and revise your plan over the course of the day.
- Commit personally and as a PLC.

Little Changes

Break!!

- Imagine you are waiting for an elevator and are thinking about what we've done today and how the ideas may fit for your classroom. Your principal walks up just as the elevator arrives, and you both get on. He or she asks you how what you are doing in the workshops will affect your teaching. You have about 1 minute to explain. So you explain that ….

Discuss with Your Administrator

- Goal: Intended to foster long-term collaborations between state higher education and K-12 entities that will improve student college readiness and increase rates of enrollment and graduation using the CCSS and assessments.
- Current Efforts: Create a Gap Analysis Tool Engage in conversations between sectors around the results.

*Core to College

Spokane Public Schools, NEWESD 101, SFCC, SCC, EWU

Network Goals:

- How could the Common Core State Standards (CCSS) result in changes/shifts in the alignment of high school exit expectations with postsecondary entrance expectations? And what supports (legislative, institutional, research, resources, conversations, etc.) need to be in place to successfully accomplish this alignment?
- How could the CCSS impact the design of remedial education courses on college campuses?
- Current efforts: Compare alignment in Analyzing Functions. Make connections to ELA standards.

Affinity Network

SFCC, SCC, Spokane Public Schools, EWU, WSU

Individual:

- 1. Go onto the Moodle:
  http://classrooms.esd101.net
- 2. Give your students the assessment item you created during the A-SSE activity. Bring copies their work (choose 10 papers randomly).

Homework

PLC:

- 3. Review norms. Each person should report any specific attempts he or she has made to implement your team's Little Change. How did students respond? As a team, record any new ideas or revisions that come out of this discussion.
- 4. Look at each others' student work from the A-SSE task and discuss what you think students were thinking. Each person should record the ideas for their task.
- 5. Please record the date and time you met, and who was at the meeting; we need to collect this for project evaluation purposes!

Homework

- What will you take with you?

- Thank you for your thorough and candid feedback!

valuations and Auf Wiedersehen

Evaluations