RAMP-A

February 6 & 7, 2015

Throughout the day, you will keep switching from sitting with either your Critical Friends group or your PLC, then switch back.
We'll start with your Critical Friends.

Theme: Develop an inquiry approach to Lesson Study and consider the connections among instructional choices and student learning of worthwhile mathematics while maintaining higher cognitive demand.

Recall our readings and discussion

From November:

1. Teaching is a moral act founded on an ethic of care.
2. Teaching is an act of inquiry and reflection.
3. Teaching and learning are each a constructivist/developmental process.
4. Understanding subject matter in evolving ways is essential.
5. Teaching is a collegial act supported by collaboration.
6. Teaching is essentially a political act.

Goals today and tomorrow:

- Observe and respond to a PLC planning their lesson study to develop inquiry strategies for three parts of your lesson studies.
- Consider how instructional choices support mathematical goals and maintain cognitive complexity.
- Brainstorm how to involve all students in meaningful discourse.
- Discuss STEM-PD technology.
- Share information related to SBAC.

Please sit with your Critical Friends Group and discuss:

How do your students use their understanding of the word ‘average’ when they make sense of the idea of the average rate of change of a function?

A vignette on discourse

- Read part of the article: *Beyond Being Told Not to Tell,* by Daniel Chazan and Deborah Ball
  - Start at the bottom right of p. 2 Algebra I: What to do about the Zero, and end the section at the top of p. 5
- As you read, think about what the learning goal was, why the teacher chose it, and how he had planned for students to reach the goal.
- What SMPs did he plan for students to use to reach the goal? How did students engage in these SMP?

Discuss

- Describe the cognitive complexity of the task, the questions he asked, and how those related to his math learning goals.
- What SMP did he hope students would use?
- What difficulties arose and why?
- What went well and why?
- If this were you, how would you plan the next lesson? How would you describe your math learning goals, the cognitive complexity, and the SMP?

Take-aways

- It is important to help students build productive meanings. These become the prior knowledge we need to help them build on.
- Fostering student sense-making through discourse is complex.
- When we plan math learning goals, we can package the content with SMP in ‘constellations’ by asking ourselves: which SMP are most likely to facilitate students’ learning of this content goal with meaning and coherence?
- How we use students’ ideas should support learning of *all* students.

Please sit with your PLC

Lesson Study Part I: Discussing the mathematical goals of the lesson

Lesson Study Part 1

As you watch, Notice:

- What seems to be the PLC's purpose in this discussion?
- What aspects of the math do they discuss?
- What issues arise and how do these issues affect their decisions about their tasks and questions?

Your turn:

Find the angle sum of a right triangle and justify your idea. Elaborate on Jackie's suggestion that starting with a rectangle and cutting it into two right triangles will put students in a context different from starting with a right triangle.

Lesson Study Part I, continued…

1. Discuss Brandon's suggestion that they could use 'half the rectangle is the right triangle' as a good discussion topic to get students to come up with informal arguments.
2. Given two scalene triangles: one acute and one obtuse, find the angle sums of each triangle in two different ways. Justify your approaches.

Whole group discussion

- What seemed to be the purpose of this PLC meeting?
- What different aspects of the mathematics did they discuss?
- What mathematical ideas did they reconsider and why?

Your Turn

- Discuss the mathematics of *your* Lesson Study.
- Use the handout to record the ideas you discuss and how you discuss them.

Break: Regroup with your Critical Friends

Developing Mathematics

- *CCSS.MATH.CONTENT.HSG.GPE.B.5*
- Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Developing Mathematics

- Try Task 1 – What are the strengths and weaknesses of the task? To what extent does this task support mastery of the standard?

- Try Task 2 - What are the strengths and weaknesses of the task? To what extent does this task support mastery of the standard?

- Compare the two tasks -

Developing Mathematics

- What is the cognitive complexity of each task and what opportunities are there for students to engage in the SMP?
- What prior knowledge would you expect students to use in each task? (The second one uses the 8th grade geometry concepts.)
- How would you adapt and use the tasks to encourage students to develop a deep and coherent understanding of the relationship between perpendicular lines?
- How do your ideas of implementation affect the cognitive complexity?

Teaching with Coherence

- **“Coherence** means attending to the structure of mathematics and the natural pathways through that structure, where “natural" means taking into account both the imperatives of logic and the imperatives of cognitive development in designing the sequence of ideas. Since these two imperatives are sometimes in conflict, attaining coherence is a complex exercise in judgment, requiring a certain amount of professional craft and wisdom of practice not easily obtained from any one source.” (Bill McCallum)

Developing Mathematics

- How could you use these tasks to teach coherently?

- What is the flow of thought through these tasks that leads to the notion of ***logical necessity*** – that is a flow of ideas and experiences that lead inevitably to one conclusion?

Lesson Study Part II
(Sit with your PLC)

- Using students' prior knowledge and including problematic aspects of the math

Notice:

How do the teachers take into consideration students' prior knowledge and what students might do?

What parts of the math do the teachers think will be difficult for students? How do they decide to deal with these?

Consider students who draw a rectangle circumscribing the given acute triangle, and discuss possible ways they could use it to find the angle sum of triangle ABC.
What difficulties might they encounter and what connections might they may make?

Lesson Study: Part II, Continued

Discuss Scott's suggestion that using a rectangle circumscribing a triangle to find the angle sum of the triangle could be a good way to bridge informal argument to more formal justification:

1. By discussing the teacher's possible role in helping students bridge informal arguments to more formal justifications.
2. By discussing why circumscribing a triangle with a rectangle may not be appropriate or useful for moving to more formal justification.

Whole group discussion:

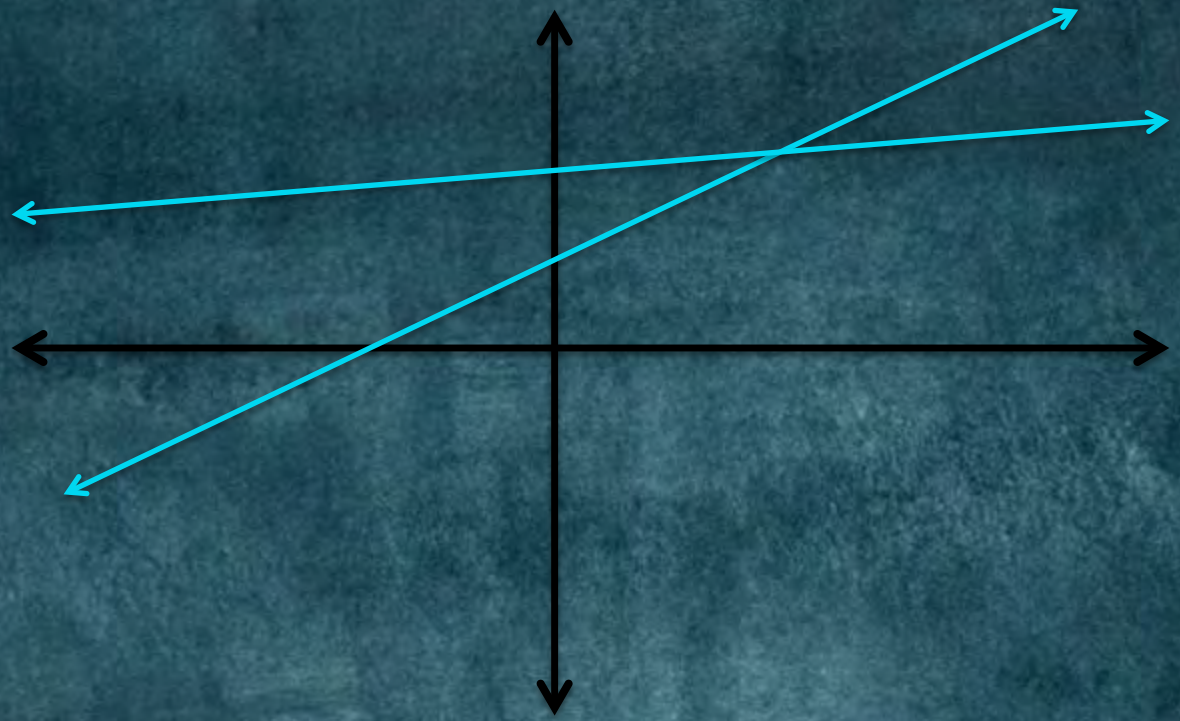
- Relate this to your lesson study plans and the sessions earlier today on using students' prior knowledge and coherence:
  - How can you consider students' prior knowledge, and the trajectory of their learning as you plan your lesson?
  - How do you consider the coherence?
  - How do you think students will respond to the ideas you have planned?

Lunch and PLC work on Lesson Study:

Sit with your Critical Friends

Developing Mathematics

- What does it mean numerically, geometrically and algebraically to add two linear functions together?



Developing Mathematics

- How could you show the result of multiplying these two functions numerically and geometrically?

- What conclusions can you draw?

Developing Mathematics

- Use technology to help you explore geometrically the outcomes of multiplying two linear functions. What would happen if…
  - The lines were parallel?
  - One had a positive slope and one had a negative slope?
  - Both functions had positive slopes or y-intercepts?
  - Both functions had negative slopes or y-intercepts?

Developing Mathematics

- What is the cognitive complexity of the task and what opportunities are there for students to engage in the SMP?
- What prior knowledge would you expect students to use in each task?
- How would you adapt and use the tasks to encourage students to develop a deep and coherent understanding of the relationship between linear functions and quadratic functions?
- How do your ideas of implementation affect the cognitive complexity?

Developing Mathematics

- How could you use these tasks to teach coherently?

- What is the flow of thought through these tasks that leads to the notion of ***logical necessity*** – that is a flow of ideas and experiences that lead inevitably to one conclusion?

Discourse For All

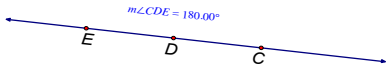
- Charlie's Story (10 minutes)
  - What stood out for you in Charlie's story?
- Readings (15 minutes)
  - *Talking About Math* (1/2 of group)
  - *Get All Students to Speak Up* (1/2 of group)
    - ***Circle*** reasons why each student needs to talk during math discussions
    - ***Underline*** strategies for engaging students in discourse
    - Share the reasons why and strategies from the two articles
- Plan your Lesson Study strategies to have all students actively participate in mathematical conversation. (25 minutes)

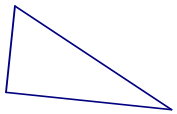
Lesson Study, Part 3
(Sit in your PLCs)

- Planning the lesson flow

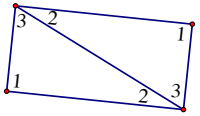
Complete the lesson plan as you complete the possible board work we started.

Show me a right angle. You may want to draw a figure or use physical objects.



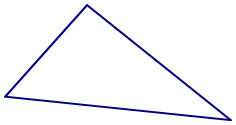


Angle sum: 360/2=180 degree



Angle sum: 360 degree = 4 * 90 degree

Question 1: Find the angle sum of the right triangle (the cutout they have).
Question 2: Find the angle sum of the following triangle:



Plan a lesson flow for your lesson study.

Note that

Evaluations for the day

RAMP-A

February 7, 2015

Theme: Develop an inquiry approach to Lesson Study and consider the connections among instructional choices and student learning of worthwhile mathematics while maintaining higher cognitive demand.

STEM-PD Technology

- Post-It Numbers:
  - If you have tried the STEM PD technology, put a 1 on a Post-It.
  - If your school has the STEM PD technology, but you have not tried it, put a 2 on a Post-It.
  - If your school does not have the STEM PD technology, put a 3 on a Post-It
- Get into small groups that have at least one of each Number in it.
- Type 1: Share your experiences and future plans
- Type 2: Share questions about your concerns and make future plans
- Type 3: Share ideas for participating in possible critical friend video discussions

Spring observations using technology?

SBAC

- Deb and Becky

Break

Tuning Protocol

1) Introduction – That's me ☺
2) Presentation (responders listen only)
3) Response (warm and cool feedback, no talking by presenters)
4) Reaction (presenters only)
5) Conversation

Evaluations

Homework

- Invite others to your Lesson Study lessons (e.g. other teachers, Jackie, Janet, Kris, Hyung Sook, your administrators…)
- Set up a spring observation.
- Send an electronic copy of your lesson study to Jackie after you have completed it.
- Be ready to share what you learned in your lesson study at the May 1 and 2 workshop.
- Invite your administrator to your presentation.