

Teaching Mathematics in the Secondary School
Spring, 2013
Wednesday 5-8pm

Week	Focus of Session	Readings and Assignments
	Join NCTM! Learn about Washington State Mathematics Council and the Northwest Math Conference	
1	<i>Week 10 of the Elementary Strand</i>	
2	Cognitive demand is a tool for understanding the potential for thinking and reasoning. We can use it to examine the tasks as we did winter quarter. We can also use the construct to consider how task launches and implementation affect students' thinking and reasoning and support ELLs' entrance into the mathematics.	<u>Assignments:</u> Turn in quiz on Cognitive demand of high school math tasks <u>Read and think:</u> Henningesen & Stein (1997) Jackson, Shahan, Gibbons & Cobb (2012)
3	Question posing needs to follow kids' ideas, not teachers' thinking. Mathematical reasoning and justification is central to doing mathematics. We need to center instruction on using reasoning and justification both in discussion (Talk moves 3 and 4) and in writing.	<u>Read and think:</u> Lannin, Barker & Townsend (2006) Herbel-Eisenman, B., Breyfogle, L. (2005).
4	Problem-based teaching requires posing rich, complex problems (groupworthy tasks) from the beginning, having students tackle those problems in various ways, and advancing their understanding through further instruction. Writing task cards requires being clear and concise, and being able to identify big mathematical ideas and pose questions in such a way that those concepts are elicited.	<u>Read and think:</u> Smarter Together, Chapter 7 Bring several rich mathematical tasks that deal with big ideas. During class, you will work on creating good task-cards for these tasks. <u>Turn in:</u> Interview Plus (see Major Assignments)
5	Mathematical modeling is often tied to functions . It is a newish territory for us to teach in high school mathematics. What do we need to help our students	<u>Read and think:</u> Read the Functions Progressions Document Read from the CCSS: High-School – Modeling (pp. 72-73)

	learn to do? Developing a culture of mistake making and learning to work with students' mistakes and misconceptions is important and valuable.	Download and explore "Geogebra" Download and explore the Core math tools from NCTM (nctm.org)
6	Published curriculum is always a compromise document between what is effective for student learning and what teachers and/or the public expect math texts to look like. We will learn to identify qualities of math texts and consider minor modifications you can make to better support student learning.	Bring to class: Examine problem-based texts (that have been scanned for you). Consider how these units build on conceptual understanding. Also bring a text from a district you are working in. In class, we will discuss the problem-based texts and consider ways to modify the other texts you may have to use to best support student learning. Turn in: Two task-cards for groupworthy tasks that you developed from last week
7	Teaching in your Practicum: No class	
8	Tracking is the biggest problem leading to inequitable outcomes for students and is founded on myths about "teaching to the middle" and student ability. Homework can be used to support students' understanding, but can also be complex when students don't do it. What is equitable, holds high expectations, and supports student learning?	Read and think: Boaler and Staples article (on moodle) http://math.berkeley.edu/~wu/Huffington_Post_op-ed.pdf NCTM recommendation on Homework: http://www.nctm.org/resources/content.aspx?id=6338 Corno (1996) Kohn (2006) (Anita has a copy for you)
9	Geometry has shifted its focus and requires a reexamination of how to teach and learn geometry	Read and think: Wu's geometry progressions document (153 pages on moodle) Turn in: "Modify a unit from a text"
10	There are an enormous amount of resources available through NCTM and as the CCSS come online. We have to use a critical lens when examining resources to consider how they may support student learning. We should consider manipulative use	Explore before class: NCTM Core Math Tools Kahn Academy Online assessments sources from OSPI and Smarter Balanced

	and “flipping the classroom”	
	Assessments – EOC, MSP, Smarter Balanced	

*As you read the assigned texts and articles, please read text closely. I have been very careful to select key texts for you to learn from. Take notes on your readings and raise questions. You may be asked to discuss readings without guided questions this quarter.

Readings

Boaler, J., Staples, M. Transforming Students’ Lives through an Equitable Mathematics Approach:
The Case of Railside School.

Corno, L. (1996). Homework is a complicated thing. *Educational Researcher* 125(8), 27-30.

Henningsen, M., & Stein, M.K. (1997). Mathematical Tasks and Student Cognition: Classroom-Based Factors That Support and Inhibit High-Level Mathematical Thinking and Reasoning; *Journal for Research in Mathematics Education*, 28, (5), .524- 549.

Herbel-Eisenman, B., Breyfogle, L. (2005). Questioning our patterns of questioning, *Mathematics Teaching in the Middle School*, 10(9), 484-489.

Kohn, A. (2006). Why Homework? *Rethinking Schools* 21(1), 32-36. (Anita has a copy for you)

Jackson, K., Shahan, E., Gibbons, L., and Cobb, P. (2012). Launching Complex Tasks. *Mathematics Teaching in the Middle School*, 18(1), 24- 29.

Lannin, J. Barker, D. & Townsend, B. (2006). Why, Why should I justify? *Mathematics Teaching in the Middle School*, 11(9), 438-443.

Wu’s geometry progressions document

Major Projects

Interview Plus (Due week 5 –or do during week 7 if you want to work it in to your practicum teaching)

Find 2 students to interview about mathematics. This interview is different from the Winter interview. You will still work on questioning strategies and eliciting students’ mathematical ideas. But you will add a layer of questioning that supports learning. Draw heavily on the Questioning Patterns of Questioning concepts of “focusing” questions to support learning.

You need to audio or video record this interview, submit your recording, and include an analysis of the student's experience and your ability to elicit and extend students' mathematical ideas.

Submission should include:

1. A list of your prepared interview questions
2. Claims about what students understand and what are their partial conceptions.
3. Evidence of students' responses (notes, drawings, portions of transcripts, video clips) that link directly to your claims about what they understand.
4. Analysis of your interview, the effectiveness, and what changes you would like to make next time.

My feedback will focus on:

- Your prepared and spontaneous questions and their effectiveness at accessing students' ideas
- Your claims about students' understandings, and the degree to which you explained what they understood
- Your clarity in tying claims to evidence
- The effectiveness of your self-analysis – how well you are noticing elements of your interviews for eliciting students' ideas

Design Groupworthy Tasks

Find or create a rich task. From there, write a task card that includes:

- A description of the task
- A clear statement of what you want students to learn as a result of this work and follow-up discussion (this is not part of the task card, but you can write it in a box on the task card so that you are clear about the learning focus and you communicate that with me.)
- A description of norms for this task, and/or task-specific elements of students' roles
- A clear description of the final product
The task must center on a big idea and include all the features of groupworthiness

My feedback will focus on:

- The degree to which this is a high cognitive demand task that includes all elements of groupworthiness
- The clarity of the task card
- A clear statement of what you want students to eventually learn as a result of this work and follow-up discussion

Modify a unit from a text.

Find a text or set of middle-level or high school mathematics curricula. Select one unit from that text.

In a binder with separate sections for each of the following and a Table of Contents at the beginning:

(a) Make a copy of the unit, including teacher materials. (If you have teacher materials that have embedded student materials, that would be the right thing to copy.)

(b) Do the math of the unit. When you do the math, draw a vertical line down your paper. Do the math in the left hand column. Use the right hand column for your reflections, insights, quandaries, etc. When you encounter complex or open-ended tasks, work to solve them in multiple ways.

(c) Identify the important mathematical skills and concepts that are afforded in the unit. (I use the term “afforded” meaning – there is an opportunity to learn those key ideas through the tasks.) Teacher materials should help you identify these, but you should also be informed by your work through the unit. You may find important skills or knowledge that the authors did not identify.

(d) Identify the Standards associated with that unit from the Common Core State Standards, including the Standards for Mathematical Practice that should be embedded in your teaching. Then describe the relationship between the standards and the unit.

(e) Read 2 research articles or summaries of research regarding student learning on the mathematical topic. Write a brief (1-2 page) summary of the article regarding how it informs your work with students. (These should not be general articles about good math teaching, but specific to your topic.) It is also important that these are research articles rather than opinion pieces. A clue to research is that when you do an online search, they start with EJ rather than ED. If you don't know how to do these searches, ask for help from a reference librarian. They are fantastic sources of information and guidance! Also, I discourage you from reading studies that have experimental designs comparing two approaches or two curricula with post-hoc tests. While they are important studies, unless the study is done on your particular curriculum unit, the results don't help you in your analysis. *(Please send me an email if you struggle to find these articles or research summaries. I may have easy access to some. I don't want you to struggle too much with this – but I do want you to know how to access research on student thinking regarding particular mathematical ideas or topics and for that to inform your work as a teacher.)*

Now things are going to get messy. For the following work you will need to be creative with using post-it notes, glue, tape,....

(f) Re-entering the textual materials, identify places in the text where your knowledge of some research on student learning (that you read in part (e)) informs your work with students. How does it inform your work? Make note

within the text. Wherever possible, anticipate student misconceptions and errors based on your reading of research articles. Note those.

(g) Analyze the cognitive demand of 10 tasks within the unit. In particular, keep an eye out for higher demand tasks. In your analysis, include your rationale for your assessment of the cognitive demand using the bulleted descriptors from your Cognitive Demand handout. (This may be in a separate section in your binder, or on post-it notes within the text.)

(h) Analyze and critique the role of context in the unit. Find a few places where context is used to engage students in examining mathematical ideas. How might the particular context support student learning? (Consider the students that you teach and their life experiences. Is the context accessible? If not – how can you provide access for students?)

(i) Identify the mathematical models, representations, and manipulatives present within your unit. What concepts are being represented or modeled? How are they modeled? What is the intended relationship between the concepts and the models? How do you anticipate students might struggle with these models?

(j) For each lesson, write a mathematical learning goal for students and identify exactly what you would pay attention to (informally assess) within the lesson that would help you know students' progress toward that learning goal.

(k) Identify a task within the unit that you think students should solve in groups. Write a task-card and make it a groupworthy task.

(l) Describe ways that you would modify the unit based on your knowledge and insights. This is an open-ended task but should be informed by our work in this program. You may consider how students have opportunity to develop the *Standards for Mathematical Practice*. You may want to consider how Kolb's learning cycle is or is not invoked or Bransford's 4 components necessary for transfer.

(m) Language Demand. Identify – in a different color of post-it note or clear way, places in the text where there are important features of language demand.

(n) Write a reflective piece individually. What are key things you learned?

Note about this project: I think it is important to honor the work of curriculum developers. While we are doing a critical analysis of their work, I do not suggest that in this short period of time, with limited resources, we are in a position to make broad claims about the texts. Often these texts are written by many people who are experts in various aspects of teaching, learning, mathematics, and curriculum writing. They are also modified based on market research in ways the authors find problematic. Our purpose here is to become highly informed teachers who are better positioned to make very thoughtful and deliberate modifications to curriculum for our classroom to best suit the developing needs of our students.