

## ***Elementary and Middle School Mathematics***

*The Evergreen State College*

Meetings: Wednesdays from 10:00 - 1:00

Sem II A3105

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### **Summary and Goals:**

Mathematics is a subject that is notoriously difficult for many people. At the same time, success in mathematics is critical for students' future educational opportunities. The goal of this course is to help you learn to teach mathematics in a way makes the content both accessible and rigorous.

The quality of the course will depend on your willingness to learn to be vulnerable and playful with ideas. Often, in our society, we think being good at math means being "quick" to get the "right" answer. This view of mathematics gets in the way responsive and rigorous teaching. It also impedes learning. As learners, I want all of us to drop our armor and be willing to make mistakes and reason slowly so that we can come together in a spirit of exploration and play.

Central to the course is a context-based investigation of the question,  
"How are multiplication and division of fractions related?"

I have selected this approach because it will allow us to coalesce as a community of learners of mathematics around a multifaceted question that confounds younger and older learners alike. While we explore the question, you will experience and practice routines, strategies and pedagogies with a disposition that invites learners into mathematical discourse.

By the end of this course, you will:

- Strengthen your own understanding of mathematics;
- Recognize how contexts invite the use of different models for thinking;
- Employ affirming ("yes") and demanding ("yes -- and") questioning strategies;
- Recognize and develop problems that provide multiple pathways and/or multiple solutions (Cohen, 1994);
- Become familiar with materials that support student thinking in ways that are congruent with how people learn;
- Develop your identity as a Math Teacher (in contrast to an identity as a teacher who happens to teach math.)

### **Assignments:**

#### ***Weekly Prep Page:***

I would like you to write weekly during this quarter to support your learning. This is a place to make sense of ideas, share what you are thinking, contrast readings against each other, and challenge or relate to ideas based on your classroom experience. This is also a place to pull together ideas discussed in the previous week's class. Therefore, it is both a prewriting and a post-class reflective assignment. Your papers should be informal but deeply reflective. That is,

they can be very conversational with Jana. I will converse back to you. They should be roughly one typed single-spaced page. Include:

- Important ideas and practices that you learned from the previous week as well as questions that linger for you (post-class reflective);
- Insights and questions that surface for you from the week's readings that are due that session.

***Math Biography:***

Guidelines distributed the first day of class.

***Peer Reviews of Lesson Plans:***

Guidelines distributed during week 3.

***Student Interview:***

Guidelines distributed during week 4.

***Lesson Plans and Practice Teaching:***

The lesson plans you develop will follow the four-column lesson plan format introduced last quarter and will include an explanation of 1.) How your lesson conforms to the principles of how people learn, 2.) The Washington State Performance Expectations addressed by your lesson, 3.) A plan for how you will know what participants have learned. Your lesson plan must include enough detail that your reader can create the lesson in his or her imagination, even without actually experiencing it. The fourth column must include specific actions and questions you anticipate being necessary during the lesson.

You will prepare 4 lessons and teach 4 times over the course of the quarter.

*Micro-teachings* -- You will develop and revise two lessons, one based on each of the sections of Van de Walle that you received on the first day of class. You will teach one of these lessons to your peers during class and teach the other to a group of at least three people outside of class time. You will have 45 minutes for each lesson. For each of these assignments you will work with an activity identified by Van de Walle that will strengthen students' understanding of fraction number sense. As you develop your lessons use as a general guide the principles of effective mathematics instruction outlined in chapters 3 "Developing Understanding in Mathematics" and chapter 4 "Teaching Through Problem Solving" of Van de Walle. Pay close attention to the section on the Role of Models in Developing Understanding (pp. 30-34), especially figure 3.11. You will receive peer response on your lesson plans before turning them in. See weekly schedule for process and due dates.

*Groupworthy Task* -- You will develop a task based on the materials you received on the first day of class using strategies and techniques you developed throughout the quarter and the criteria for groupworthy tasks as presented winter quarter. We will extend class by one hour weeks seven and eight so that each group can have more time. While I will provide you with materials that set a *general direction* for your task, you will need to develop a task card, implement group roles and write a lesson plan as indicated above. Use Van de Walle and TESC's curriculum library to expand your understanding of the mathematics in the problem.

*Share the work* -- Divide the lesson by the number of people you have in your group. Do so logically. Each person needs to be prepared to lead each portion of the lesson -- from launching the task to leading a reflection on what people learned. One hour before

class, I will randomly draw names for the order in which group members will teach. You will lead the lesson in the order in which names were drawn. I will send out an email to let you know the results of the draw.

You will have one hour and twenty minutes to teach the lesson from start to finish. I will take detailed notes during the lesson to help trigger your memories for your reflection.

*Reflections for micro-teachings and group-worthy task--*For your lessons, you will offer an analysis of using following guiding questions:

- Was I able to anticipate what students would do and say?
- Were my interventions effective?
- What ideas did students have that I did not anticipate?
- In what ways did the lesson plan help my teaching of the lesson?
- What changes do I need to make to maintain the mathematical challenge for all students?
- What evidence do I have of student learning?
- What evidence do I have that content was both accessible and rigorous?

*What to turn in for each lesson --*

Revised 4-Column Lesson Plan (use fonts or ink-color to make revisions evident)

Reflection on teaching experience

Task card (for groupworthy task only)

*Summative Demonstration Lesson --* During our last session together, each of you will teach a 45 minute lesson based on Van de Walle that serves as an application of the principles of your identity as a math teacher. With your lesson plan (yes, 4-column again) you will turn in a two-page statement of your math teaching philosophy that includes an articulation of how your lesson design illustrates your developing approach to teaching mathematics.

### **Texts and Resources:**

Boaler, J. (2008) *What's math got to do with it.*

Van de Walle, J. (2007 or later). *Elementary and middle school mathematics: Teaching developmentally.*

Fosnot, K. (2007) *Exploring parks and playgrounds.*

Walsh, J. & B. Sattes, (2005) *Quality questioning: Research-based practice to engage every learner.*

Mewborn & Hubert, "Questioning your way," *Teaching children mathematics*. Dec. 1999.\*

Kazemi & Stipek. (2001) "Promoting conceptual thinking in four upper-elementary mathematics classrooms," *The Elementary School Journal*, 102: 1.\*

Cohen & Lotan, TBA \*

Washington State Mathematics Standards, <http://www.k12.wa.us/mathematics/Standards.aspx>

*Connected Mathematics*, Lappan et. al.\*\*

*Investigations in Number, Data and Space*, Russell et. al.\*\*

\* to be posted on ELM.

\*\* available in the curriculum resource room at the TESC Library.

Week	Focus/Activities	Preparation	Follow-up
1	Introduce principles that provide access to mathematical tasks. Set and practice norms Course overview Introduce the 'Launch' Running for Fun, part one	Rest, resulting in renewed enthusiasm.	
2	Discuss readings Introduce the math congress -- Running for Fun, part two. Introduce Strings -- models of/for thinking 'Launch' Training for Next Year's Marathon -- Part One	Math Biography Weekly Prep Page <ul style="list-style-type: none"> <li>• "Questioning Your Way" (Mewborn &amp; Huberty)</li> <li>• Van de Walle (pp. 23-59)</li> </ul>	
3	Discuss reading Micro-teaching A, B, C, D String -- flexibility with numbers Math Congress -- Training for Next Year's Marathon -- Part Two	Weekly Prep Page <ul style="list-style-type: none"> <li>• Boaler (pp. 1 - 122)</li> </ul> Lesson plans (all -- E, F, G and H prep A, B, C, and D as though they were teaching.)	
4	Discuss reading Micro-teaching E, F, G, H Launch "Comparing Black Top Areas" Student interview footage	Weekly Prep Page <ul style="list-style-type: none"> <li>• Boaler (pp. 123 - 219)</li> </ul> Lesson plans (all -- A, B, C, and D prep E, F, G and H as though they were teaching.)	
5	Discuss reading Question analysis <ul style="list-style-type: none"> <li>• Using revised lesson plans</li> <li>• Video footage</li> </ul> Examining student work	Weekly Prep Page <ul style="list-style-type: none"> <li>• Walsh (pp. 22-75)</li> </ul> Submit peer reviewed, revised lesson plans and reflection. Written peer reviews	
7	Discuss reading <b>Class meets for an extra hour</b> Groupworthy Tasks I & II	Weekly Prep Page <ul style="list-style-type: none"> <li>• Cohen or Lotan reading, TBA</li> </ul> Task card and lesson plan Groupworthy Task groups I & II	
8	Discuss reading <b>Class meets for an extra hour</b> Groupworthy Tasks III & IV	Weekly Prep Page <ul style="list-style-type: none"> <li>• Kazemi &amp; Stipek</li> </ul> Task card and lesson plan Groupworthy Task groups III & IV	
9	Summative Demonstration Lessons	Submit revised groupworthy task lesson plan Summative lesson and paper	

