# California State University San Marcos
## SCHOOL OF EDUCATION

# EDSS 543B – SECONDARY MATHEMATICS EDUCATION
Spring 2013     University Hall 273
Thursday 4:00-7:00 pm

**Professor**: Brian R. Lawler, Ph.D.
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Office hours: by appointment

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## Mission Statement of the School of Education, CSUSM

The mission of the School of Education Community is to collaboratively transform public education by preparing thoughtful educators and advancing professional practices. We are committed to diversity, educational equity, and social justice, exemplified through reflective teaching, life-long learning, innovative research and on-going service. Our practices demonstrate a commitment to student-centered education, diversity, collaboration, professionalism, and shared governance. *(Adopted by COE [SoE] Governance Community, October, 1997).*

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## Course Description

Focuses on developing an understanding of theory, methodology, and assessment of Mathematics in integrated and secondary classrooms, Part B. *This course is aligned with California's SB 2042 Standards.*

### Prerequisites

Admission to the Single Subject Credential Program.

### Unique Requirements

Observation and participation in the public schools, including collaborative planning with teachers.

## Student Learning Outcomes

### Objectives

Learning to teach mathematics is difficult, and thus you must expect that this course, in concurrence with your clinical practice, will only begin your education in learning how to teach mathematics. Furthermore, this course is intentionally focused on developing professionals in the field of secondary mathematics education. The course is but one stage in what I hope will be a continuing evolution for you as a mathematics teacher; learning to teach mathematics well will be the work of your career.

Specifically, the foci of this course are to: (1) developing an understanding of the current practices in mathematics, best practices in teaching mathematics, and the ways in which these practices intersect and conflict; (2) learning to teach content-specific concepts, algebraic thinking in particular, using effective, appropriate, and equitable strategies; and (3) practicing how to teach for mathematical understanding.

Enfolded into this course will be learning about children's mathematical ways of thinking and operating, creating a classroom environment that promotes the investigation and growth of mathematical ideas, developing strategies to ensure the success of all students in multi-cultural, heterogeneous settings, consideration of curriculum development, and the ongoing formation of a personal theory of mathematics teaching and learning grounded in work for social justice.

### Teacher Performance Expectation (TPE) Competencies

The course objectives, assignments, and assessments have been aligned with the CTC standards for Single Subject Credential (Mathematics). This course is designed to help teachers seeking the California Single Subject Credential (Mathematics) to develop the skills, knowledge, and attitudes necessary to assist schools and district in implementing effective programs for all students. The successful candidate will be able to merge theory and practice in order to realize a comprehensive and extensive educational program for all students. You will be required to formally address the following TPEs in this course:

The following TPEs are given primary emphases:
  TPE 1b    Subject Specific Pedagogical Skills for Single Subject Teaching (Mathematics)
  TPE 2     Monitoring Student Learning During Instruction

The following TPEs are given secondary emphases:
  TPE 3     Interpretation and use of assessments
  TPE 4     Making content accessible
  TPE 5     Student engagement
  TPE 6c    Developmentally appropriate practices in grades 9-12
  TPE 6d    Developmentally appropriate teaching practices for special education: teaching the special education population in the general education environment
  TPE 7     Teaching English learners
  TPE 8     Learning about students
  TPE 9     Instructional planning
  TPE 10    Instructional time
  TPE 11    Social environment
  TPE 13    Professional growth
  TPE 14    Educational technology in teaching and learning
  TPE 15    Social justice and equity

### California Teacher Performance Assessment (CalTPA)

Beginning July 1, 2008 all California credential candidates must successfully complete a state-approved system of teacher performance assessment (TPA), to be embedded in the credential program of preparation. At CSUSM this assessment system is called the CalTPA or the TPA for short.

To assist your successful completion of the TPA a series of informational seminars are offered over the course of the program. TPA related questions and logistical concerns are to be addressed during the seminars. Your attendance to TPA seminars will greatly contribute to your success on the assessment.

Additionally, SoE classes use common pedagogical language, lesson plans (lesson designs), and unit plans (unit designs) in order to support and ensure your success on the TPA and more importantly in your credential program.

The CalTPA Candidate Handbook, TPA seminar schedule, and other TPA support materials can be found on the SoE website: http://www.csusm.edu/education/CalTPA/ProgramMaterialsTPA.html

### Authorization to Teach English Learners

This credential program has been specifically designed to prepare teachers for the diversity of languages often encountered in California public school classrooms. The authorization to teach English learners is met through the infusion of content and experiences within the credential program, as well as additional coursework. Students successfully completing this program receive a credential with authorization to teach English learners. *(Approved by CCTC in SB 2042 Program Standards, August 02)*

### Students with Disabilities Requiring Reasonable Accommodations

Students with disabilities who require reasonable accommodations must be approved for services by providing appropriate and recent documentation to the Office of Disable Student Services (DSS). This office is located in Craven Hall 4300, and can be contacted by phone at (760) 750-4905, or TTY (760) 750-4909. Students authorized by DSS to receive reasonable accommodations should meet with their instructor during office hours or, in order to ensure confidentiality, in a more private setting.

**Course Requirements**

***Required Texts***

Abbot, E. A. (1992). *Flatland: A romance of many dimensions.* Dover. (Originally published in 1884.)

Cohen, E. G. (1994). *Designing groupwork: Strategies for the heterogeneous classroom*. New York: Teachers College Press. [purchased for fall 2010]

Driscoll, M. J. (2007). *Fostering geometric thinking: A guide for teachers, grades 5-10*. Portsmouth, N.H.: Heinemann.

Fendel, D. M., Resek, D., Alper, L., & Fraser, S. (1997). *Interactive Mathematics Program Year 3: The Orchard Hideout Teacher's Guide*. Berkeley: Key Curriculum Press. [purchase by phone, view online http://www.keypress.com/x5480.xml]

Smith, M. S., Stein, M. K. (2011). *5 practices for orchestrating productive mathematics discussions*. Reston, VA: NCTM.

***Several other readings are required and will be made available for download.

***Recommended Texts***

Boaler, J. (2008). *What's math got to do with it?: Helping children learn to love their most hated subject—and why it's important for America*. New York: Viking.

Carr, J., Carroll, C., Cremer, S., Gale, M., Lagunoff, R., Sexton, U. (2009). *Making mathematics accessible to English learners*. San Francisco: WestEd.

***Key Assignments***

*1. Weekly Homework (20%)* – Each week, teacher candidates will be assigned to read, respond to readings, and prepare some mathematical investigation. Each of these activities is designed to be in preparation for discussion during the next course session. As such, it is critical that they are completed on time. The specifics of each weekly assignment will be provided in class. Work is to be submitted online in the Cougar Course. In addition, responses are to be brought to class in hard copy.

*2. Student Interview (15%)* – Students will design prompts and/or a task in order to conduct a clinical interview with a grades 6-10 student. This interview protocol will be designed to inquire into the student's geometric ways of thinking. The purposes of this activity are to begin thinking about students' mathematical understanding, to learn how to effectively pose questions and interpret the meaning of students' answers, and to interact with students about mathematics.

*3. PBL Unit Project (40%)* – Students will develop a Project-Based Learning unit in conjunction with a teacher from High Tech High – North County (HTHNC). This project will emerge, develop, and flow in an organic manner, one that is very reflective of the real work of a professional learning community that may exist within the mathematics department of a school site. Each student will be individually responsible for full participation in the activities to develop the unit, and for the development of approximately 2-3 one-day lesson scripts. The lesson scripts that will be developed include defining the mathematical task for that lesson, as well as a homework assignment that prepares students for the lesson, or follows up the lesson (to be decided). Students will observe the cooperating teacher's classroom 2-3 times (total approx. 3 hours of observation). Data will be collected and reflected upon. This data will inform changes to the observed lesson plans.

The final product, to be submitted by each student individually, will be a collection of the body of work generated during the collaboration to develop, implement, and reflect upon the co-authored PBL unit. It must include the personally developed lessons and materials, personal observation sheets, and some indicator of reflection on observation and *substantial* revision to the initial lesson plan. It will include a cover letter that serves to summarize the experience and discuss 3 artifacts in particular that serve as evidence for this discussion. A table of contents is also required to help organize the submission.

*4. iPad Usage Report and Reflection (10%)* – You have been loaned an iPad to use both as a student (learner) and as a teacher. I have asked you to very intentionally explore the technology in both ways. This assignment will be a rather brief report (2-4 pages) that summarizes your experiences. Include a summary of the journey—especially describing 3 specific experiences, identify 3 apps you recommend (and maybe 1 you do not), the opportunities the iPad affords / constrains, and general pros and cons.

*5. Personalized Project (15%)* – This final assignment is intended to encourage the study of a topic in mathematics education of personal interest. Students will share their learnings with classmates in a semester-concluding "Ignite"-style <http://ignite.oreilly.com> < http://www.keypress.com/x25933.xml> presentation. Some students will center this project based upon their experiences at the Greater San Diego Math Council annual meeting, taking place in San Diego, 1-2 February 2013.

### Grading Standards

Course grades will be based on the following grading scale:

| | | | | | |
|---|---|---|---|---|---|
| A | ….. | Excellent | ….. | 90 – | 100% |
| B | ….. | Above Average | ….. | 80 – | 89% |
| C | ….. | Average | ….. | 70 – | 79% |
| F | ….. | Failing | ….. | less than 60% | |

I assign grades to individual assignments based on the following interpretation:

- B ….. achieves expectations/purpose of the assignment;
- A ….. and impresses in some manner;
- C ….. falls short of the assignment expectations in some way.

Please remember that a *B* is not for *B*ad.

Unless *prior arrangements* have been agreed to with the instructor, work submitted late, but within one week of the due date will be reduced by one letter grade, and work received over one week late will receive no credit.

### School of Education Attendance Policy

Due to the dynamic and interactive nature of courses in the School of Education, all students are expected to attend all classes and participate actively. At a minimum, students must attend more than 80% of class time, or s/he may not receive a passing grade for the course at the discretion of the instructor. *Individual instructors may adopt more stringent attendance requirements.* Should the student have extenuating circumstances, s/he should contact the instructor as soon as possible. *(Adopted by the COE [SoE] Governance Community, December, 1997).*

*Attendance and Participation:* Due to the fast paced and highly interactive nature of the course, regular attendance and full participation are expected. Learning is difficult. It is even more difficult, if not impossible, if one is not present for and engaged in the process. Therefore, the above SoE Attendance Policy is amplified as follows:

- Missing more than one class meeting will result in the reduction of one letter grade.
- Arriving late or leaving early on more than two occasions will result in the reduction of one letter grade.

You are expected to inform the instructor *prior* to an absence.

### All-University Writing Requirement

All CSU students must demonstrate competency in writing skills as a requirement for graduation. At California State University San Marcos, students complete the graduation writing assessment through the All-University Writing Requirement. This requirement mandates that every course at the University must have a writing component of at least 2,500 words (approximately 10 pages). The assignments for this course meet this requirement.

### CSUSM Academic Honesty Policy

"Students will be expected to adhere to standards of academic honesty and integrity, as outlined in the Student Academic Honesty Policy. All written work and oral presentation assignments must be original work. All ideas/materials that are borrowed from other sources must have appropriate references to the original sources. Any quoted material should give credit to the source and be punctuated with quotation marks.

Students are responsible for honest completion of their work including examinations. There will be no tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty in accordance with the general rules and regulations of the university. Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a whole."

Incidents of Academic Dishonesty will be reported to the Dean of Students. Sanctions at the University level may include suspension or expulsion from the University. Consult the University catalog for further questions about academic honesty.

*Plagiarism:* As an educator, it is expected that each student will do his/her own work, and contribute equally to group projects and processes. Plagiarism or cheating is unacceptable under any circumstances. If you are in doubt about whether your work is paraphrased or plagiarized see the Plagiarism Prevention for Students website http://library.csusm.edu/plagiarism/index.html. When relying on supporting documents authored by others, cite them clearly and completely using American Psychological Association (APA) manual, 6th edition. If there are questions about academic honesty, please consult the University catalog.

**Tentative Schedule**

| Date | Topic* | Assignment to be completed BEFORE Class Session** |
|---|---|---|
| Session 1<br>24 jan 13<br>4:00-7:00 | Course Introduction: Complex Instruction; Problem-Based Mathematics / Project-Based Mathematics; and Geometric Thinking | *Preview Flatland, pp. iii-40* |
| Session 2<br>30 jan 13<br>4:00-7:00 | Introduce PBL Unit Project, collaborate with HTH faculty | *Read F.G.T. – Driscoll, chs. 1-2* |
| Session 3<br>1-2 feb 2013 | GSDMC Conference<br>Mathematics Education as a Learning Profession | |
| Session 4<br>open | Collaboration with HTH faculty for PBL Unit Planning | *Read 5P. – Smith & Stein, chs. 1-2*<br>*Read F.G.T. – Driscoll, ch. 3* |
| Session 5<br>21 feb 13<br>4:00-7:00 | Fostering Geometric Thinking<br>Complex Instruction<br>Introduce the idea of *Cognitive Demand* of Tasks | *Read D.G. – Cohen, chs. 1-3*<br>**2. Interview** |
| Session 6<br>open | HTH Observations of PBL Lesson Implementation | |
| Session 7<br>28 feb 13<br>4:00-7:00 | Complex Instruction | *Read D.G. – Cohen, chs. 4-6* |
| Session 8<br>14 mar 13<br>4:00-7:00 | Teaching *Angle*<br>Rich Tasks | *Read F.G.T. – Driscoll, ch. 4-5*<br>*Read D.G. – Cohen, chs. 7-8* |
| Session 9<br>28 mar 13<br>4:00-7:00 | Teaching to engage ALL mathematics learners – revisit lesson planning, cognitive demand / rich tasks, CCSS, and Complex Instruction | **3. PBL Unit Project** |
| Session 10<br>2 may 13<br>4:00-7:00 | Reflections on Student Teaching & Mathematics Education | **4. Electronic Portfolio**<br>**5. Professional Reading** |

*This schedule is an *approximation*. Given the nature of this course, we will likely be altering the scheduled topics and possibly times and dates in order to accommodate student interest, observe and teach in mathematics classrooms, and take advantage of professional development opportunities. In particular, **reading assignments (in italics) are likely to adjust as the class unfolds.

## 2. Student Interview Assignment

**Task:** In a one-on-one setting you will conduct an interview with a student from grades 6-11. Instructions are attached below. This interview protocol is designed to inquire into the student's geometric ways of thinking.

**Purpose:** Most concisely, to *learn to listen* for a child's ways of thinking mathematically and of knowing mathematically. Jo Boaler just said in a workshop in Vista, "assessment should only be used to inform student learning, not for evaluative judgment."

The student interview is designed to provide you with opportunities to focus on and build a model of a single child's thinking about mathematics. The purposes of this activity are to begin thinking about students' mathematical understanding, interpret the meaning of students' answers, and to provide you with an opportunity to interact with students about mathematics. It will also help you to improve your use of inquiry for assessment purposes and to better understand secondary level students with different understandings.

**Prior to the interview:**
- Identify a (one) student. Although there are many good reasons to select a student from within a classroom you may be teaching, *any* student (grades 6-11) could make for a productive experience. One that you have found to be verbally expressive may be best. Arrange with the student and his/her teacher to interview this one child for 20-30 minutes in a quiet place outside the classroom.
- Consider what clarifying prompts you may have to give to the student during the interview.

**During the interview:**

Work with the child in a setting removed from the classroom environment. Begin the interview by informing the child that you will be giving her/him a series of math problems to solve and that you are interested in his/her thinking process and in the strategies s/he uses to solve these problems. Inform the child that s/he can solve the problems in any way s/he wants. Please remind the child that the interview is voluntary and that s/he can end the interview at any time (if a student does cut the interview very short, then please find another willing student). Do everything you can to help make the child comfortable.

Orally provide the child with your task and provide her/him with sufficient time to complete each problem. You will be challenged to establish comfort, for both you and the student, to think quietly for the extended period of time necessary for the child to meaningfully engage in the task. You may also want to prepare a written copy of each problem, in case you find the child prefers this way of interpreting the task.

*Note the questions you ask and the child's responses.* It may be necessary to ask the child to wait while you are writing—it is OK to ask the child to wait. *You should not tape-record/video-tape the interview.*

During the interview, be sure to consider the following:
- The best thing you can be is genuinely curious. Remember the point of the interview is to discover how the child thinks—*NOT* to guide the child to the correct answer (try to fight the urge to be "teacher").
- Although you may prepare a script to help guide your interview, I encourage you to not feel limited to your script. Allow your interaction to explore a student's idea, to learn more about the child's insights into a question, their disposition toward exploration, what may constrain what they are able to do, and to practice your own interaction with children.
- Do respect the suggested and arranged time limit.
- Be careful to respond similarly to all responses, whether you may consider it to be a "correct" or "incorrect" answer. Be curious about all solution strategies; how is this student thinking? what question may they be asking?—is it the one you first assumed they were asking? what question may they be answering?—is it the one you first assumed you asked?
- This is not a teaching episode; it is an interview.
- Your primary role is to listen (Davis, 1997). Make sure you allow enough *wait time*—many children need time to think before speaking and/or answering.
- Make sure the child feels comfortable during the entire interview. If the child clearly cannot answer a problem, you may need to probe to help develop connections the child may have to

similar mathematical experiences. Two useful questions: *tell me what you do know about the problem*, and *tell me about a similar problem you've worked on before*. If you feel that the child is really struggling and frustrated, you may want to end the interview or give the child a problem you are fairly certain s/he can solve and then end the interview. It is worthwhile to come with this sort of simpler problem, as well as an extension to the task you intend to ask for those who respond quickly. If you cut an interview short for any reason, be sure to discuss in your write-up.

### After the Interview:

Write a three to four-page (double-spaced) reflection that includes a brief discussion on each of the following points:

- What *specifically* did you learn about this child's mathematical understanding? Here you will want to make some claims about the mathematics your student understands or doesn't understand. I intend for this portion to emphasize what the child **CAN** do, and what might be a worthwhile next instructional focus, rather than what the child *cannot* do.
- Suggest some specific ideas for instruction based on what you have observed about the students understanding and methods of approaching the problems.
- Discuss what types of geometric thinking you observed the student use.
- Share some thoughts on your role as a listener in this activity, and as you consider your profession as a mathematics teacher.
- Attach any recorded work generated by the student without the student's "actual" name listed.

**Grading:** Specifically, I expect a well-written paper (3-4 pages, double-spaced) that clearly and specifically expresses what you learned about: (a) the child's mathematical understanding, (b) the experience of observing mathematical thinking.

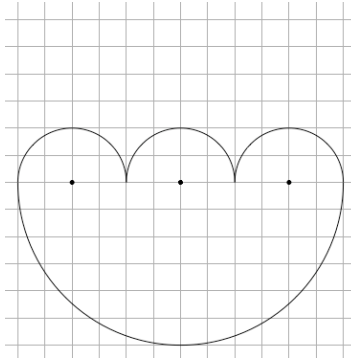**Due:** 6 feb 2013, posted to Cougar Courses

**Circular Pastures**

In Round County, all pastureland is formed by circles or partial circles connected together. For example, Pasture A is made from three half-circles, as seen on the map below.
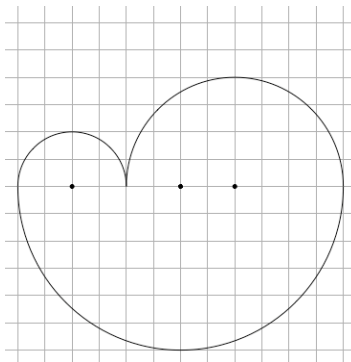

Pasture A

Pasture B is made from four half-circles.


Pasture B

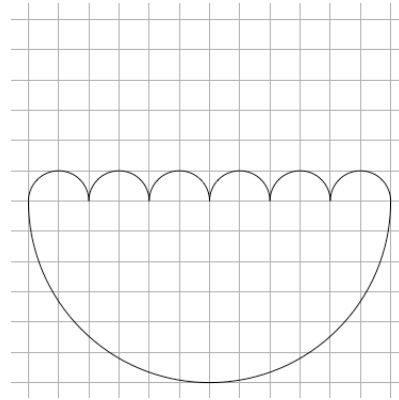Pasture C is made from three half-circles, but a different combination than Pasture A.
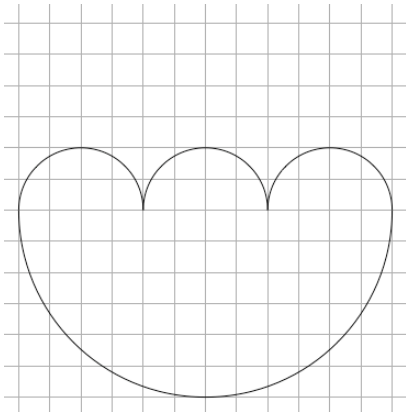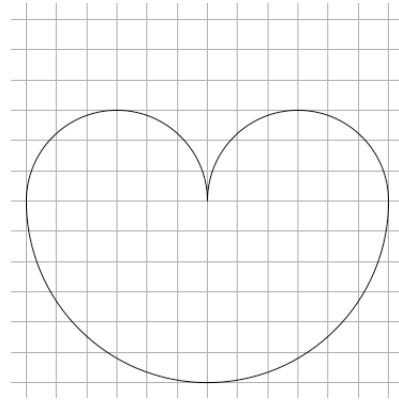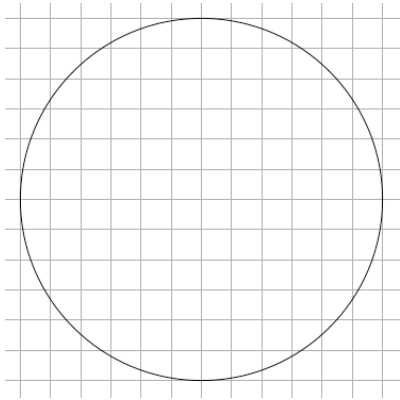

Pasture C

Which of these Pastures, A, B, or C, has the greatest area for animals to roam and graze? The least area? How did you decide?

The owners of the three pastures need to put fencing around their pastures. Assume the fencing follows the edges of the figures that appear on the three pasture maps. Which Pasture needs the most fencing? The least? Why?

How much fencing will it take for Pasture A, Pasture B, and Pasture C? How do these amounts compare with each other? Explain this relationship.

Will the perimeter *always* be the same no matter how many mounds? Why is this happening?

# 5. Personalized Project

**Task:** Learn something new about teaching mathematics, following your own interests. Present it to the class in a 5-minute presentation.

**Purpose:** Students will have the opportunity to learn more about an area of teaching mathematics that is of particular interest of them. Several topics are introduced in the EDSS 543 course that could be further investigated, or questions that arose during clinical practice experiences. This project is a great opportunity to explore further what might be called theory of mathematics education toward exploring a personal vision for the teaching of mathematics. It could also take a more practical—as in what can I use this semester or next year—approach that looks to apply important theoretical principles to practice. Its intent might be somewhat different than both, and to just learn more about the field of mathematics education—such as a study of the past 20 years of mathematics education in California, or the US, or possibly another country (you might focus on something in particular with regard to this historical look).

**Details:** Explore a self-selected topic related to mathematics education, the teaching of, and/or learning of mathematics. The investigation ought to be driven by a question you would like answered, or at least know more about. If you attended either the CMC-S or GSDMC annual conference, I strongly encourage you to use one of the sessions, or a sequence of sessions, as a jumping off point for this presentation. Alternatively, read a journal article as a base for your presentation. I encourage all students to broaden your understanding by finding at least 2 additional resources that give you further insight or ideas about your topic. These additional resources may be web-based.

**Report:** Students will present their learnings as an Ignite-style <http://ignite.oreilly.com> <http://www.keypress.com/x25933.xml> five-minute presentation: 5 minutes, 20 slides, 15 seconds per slide.

**Grading:** Worth 15 points, awarded for completion of the specifics of the task, and the quality of the response. A grade of **B** will be awarded for completing the task; an **A** for doing so exceptionally well, and a **C** for partial completion.

**Due:** 2 may 2013, you will present to class.