

**California State University San Marcos  
SCHOOL OF EDUCATION**

**EDSS 543A – SECONDARY MATHEMATICS EDUCATION**

FALL 2012      University Hall 273  
Thursday 4:00-7:00 pm

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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 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 A. *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.

**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.

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 (TPA)**

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

- California Department of Education (2010). *California Common Core Content Standards for Mathematics*. Sacramento, CA: Author. This document can be found at <http://www.cde.ca.gov/ci/cc/>
- Cohen, E. G. (1994). *Designing groupwork: Strategies for the heterogeneous classroom*. New York: Teachers College Press.
- Driscoll, M. J. (1999). *Fostering algebraic thinking: A guide for teachers, grades 6-10*. Portsmouth, NH: Heinemann.
- Fendel, D.M., Resek, D., Alper, L., & Fraser, S. (1997). *Baker's choice*. Berkeley: Key Curriculum Press. [ISBN: 978-1-55953-145-0; purchase online at <http://bit.ly/Lt4ciF>]

\*\*\*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.
- National Council of Teachers of Mathematics (2009). *Focus in high school mathematics: Reasoning and sense-making*. Reston, VA: Author.

### Key Assignments

1. *Weekly Homework & Participation (20%)* – Each week, teacher candidates will be assigned to read, respond to readings, and prepare some mathematical investigation. Each of these activities are 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 (20%)* – In small groups, teacher candidates will design prompts and/or a task in order to conduct a clinical interview with a grades 6-11 student. This interview protocol will be designed to inquire into the student's algebraic ways of thinking. Each of you will carry out an actual student-interview based on this protocol. Groups will then reconvene to study student responses. 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 provide you with an opportunity to interact with students about mathematics. Further details are attached.
3. *Professional Reading (10%)* – Teacher candidates will select an article from a professional mathematics education journal to read, summarize, and present to colleagues in the course. Further details are attached.
4. *Lesson Plan Development & Implementation (30%)* – Working in small groups and in conjunction with practicing teachers, teacher candidates will develop several iterations of a lesson plan, the last of which will be implemented in a secondary mathematics class. TCs will conclude this assignment with a presentation by the working group outlining the lesson, experiences with students, demonstration of formative assessment through the analysis of student work, teacher reflections, and change designed for the next use of the lesson. The purpose of this activity is to engage fully in the teaching cycle, with particular focus on the design of effective mathematical lessons. Further details will be distributed.
5. *Problems of the Week (10%)* – During the semester, teacher candidates will investigate 2-3 open-ended mathematical problems. Each teacher candidate will be asked to initiate and lead classroom discussion (10-15 min.) of one of these problems by sharing your thinking about the task. At the end of the semester, each teacher candidate will select one problem to formally write-up using a 5-stage write-up format. Further details are attached.
6. *Portfolio of Linear Programming Unit (10%)* – As ongoing classwork and homework, teacher candidates investigate a unit developing mathematics of Linear Programming. A record of what was learned and the experiences of learning will be submitted at the close of the semester. Further details will be provided in class.

## **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%
D	.....	Below Average	.....	60	–	69%
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 *Bad*.

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 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, 6<sup>th</sup> edition.

### Tentative Schedule

Date	Topic*	Assignment to be completed BEFORE Class Session**
Session 1 30 aug 12 4:00-7:00	Course Introduction Mathematics Standards	<i>Preview the CaCCSS-M, pp. 46-72</i>
Session 2 31 aug 12 10:30-12:30	Developing Mathematical Understanding	<i>Read Boaler Mathematics assignment</i>
Session 3 6 sep 12 4:00-7:00	Equity & Social Justice in Mathematics Education Algebraic Thinking & Student Interview	<i>Read Gutstein, &amp; F.A.T. Mathematics assignment</i>
Session 4 20 sep 12 4:00-7:00	Algebraic Thinking Developing Lessons, and Lesson Plans	<i>Read Davis, Smith, &amp; F.A.T. Mathematics assignment</i> <b>2. Interview</b>
Session 5 TBD	Lesson Observation Mathematics Education as a Learning Profession	<i>Read Fendel et al. Mathematics assignment</i>
Session 6 27 sep 12 4:00-7:00	Learning & Knowing	<i>Read Brooks &amp; Brooks, &amp; Smith Watch Annenberg video Mathematics assignment</i> <b>3. Lesson Plan</b>
Session 7 4 oct 12 4:00-7:00	Strategies for Differentiation & Language Learners Mathematics Education as a Learning Profession	<i>Read WestEd Mathematics assignment</i> <b>4. Professional Reading</b>
Session 8 18 oct 12 4:00-7:00	Assessment	<i>Read Stuzman &amp; Race (and 1-2 more articles) Mathematics assignment</i> <b>5. POW</b>
Session 9 15 nov 12 4:00-7:00	Reflections on Student Teaching (Mathematics) Classroom Management --Engaging students --Building community	<i>Read NCTM Mathematics assignment</i> <b>6. Electronic Portfolio</b>

\*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 algebraic ways of thinking.

**Purpose:** 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 student. Although there are many good reasons to select a student from within a classroom you may be teaching, any student (grades 6-11) should make for a productive experience. 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 few mathematical questions to consider, 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 algebraic 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, concise 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.

### *Student Interview Prompts: Prompts/Problems to elicit Algebraic Thinking*

Select only *one* of these problems. The prompt is to be read aloud. Although you can add to the prompts for clarity, suggesting paths to solutions changes your role to instructor; you are to be an interviewer only. Provide options of tools for the student to use as well as plain or grid paper. The student should be allowed to choose whatever they want.

#### **I. Sneaking up the Line**

Eric the Sheep is at the end of a line of 50 sheep waiting to be shorn. But being an impatient sort of sheep, Eric sneaks up the line two places every time the shearer takes a sheep from the front to be shorn. So, for example, while the first sheep is being shorn, Eric moves ahead so there are two sheep behind him in line. If at some point it is possible for Eric to move only one place, he does that instead of moving ahead two places.

How many sheep get shorn before Eric?

1. Predict a solution "in your head."
2. Use any method or tools or objects you would like to solve these two problems...

#### **II. Age Problem**

1. Classify all numbers that leave a remainder of 3 when divided by 5 *and* a remainder of 1 when divided by 3.
2. If my age is divided by 3, the remainder is 2. If my age is divided by 5, the remainder is also 2. If my age is divided by 7, the remainder is 5. How old am I?

#### **III. Clock Problem**

At what time after 4:00 will the minute hand of a clock overtake the hour hand?



## 5. Problem of the Week Assignment

**Task:** Teacher candidates (TCs) will investigate 2-3 mathematical “Problems of the Week” (POW) during the semester. From among these, each TCs will present their thinking on the problem to the class, in a manner intended to initiate discussion of the task. Finally, each TC will write up **one** of the 2-3 problems utilizing the report format described below. (Note: if the POW you’ve selected includes particular suggestions about this format, please adhere to the suggestions while following the format below.) You will have to make a decision on how far you wish to explore the problem you select to write up. At bare minimum, respond to each question posed in the task, even if you feel your response is only partial, for the moment.

**Purpose:** Doing and being mathematical is much more than learning and applying formulae, algorithms, and other procedural techniques. The *National Council of Teachers of Mathematics* (NCTM) set forth in their *Principles and Standards for School Mathematics* (2000) an overview of both *content* and *process* standards. While content standards include a characterization of appropriate understanding at the conclusion of a secondary education concepts from Number & Operations, Algebra, Geometry, Measurement, and Data Analysis & Probability, the process standards define ways of doing and understanding mathematics, and are held at an equal weight to the content standards. These process standards include: Problem Solving, Reasoning and Proof, Communication, Connections, and Representation. The importance of these process standards are re-emphasized in the *Focus on High School Mathematics* (2009) in which NCTM recommends that all high school mathematics programs focus on reasoning and sense-making. And most recently, the *California Core Content State Standards* for mathematics emphasize *Standards for Mathematical Practices*.

This task is meant to involve you directly in experiencing mathematics as characterized by these standards, but also to provide an experiential context to think about teaching mathematics in such a way that students come to know the NCTM’s vision for mathematics as well.

### Details – The Report:

**Problem Statement:** State the problem clearly in your own words. Your problem statement should be clear enough that someone unfamiliar with the problem could understand what it is that you are being asked to do. This means they have been provided all necessary information to solve the task for themselves.

**Process:** Describe what you did in attempting to solve the problem, using your notes as a reminder. Include things that didn’t work out or that seemed like a waste of time. Do this part of the write-up even if you didn’t solve the problem. If you get assistance of any kind on the problem, you should indicate what the assistance was and how it helped you.

**Solution:** State your solution as clearly as you can. It should be apparent to the reader you have provided a response to the question posed in the *Problem Statement*. Explain how you know that your solution is correct and complete. (If you obtained only a partial solution, give that. If you were able to generalize the problem, include your general results.) Your explanation should be written in a way that will be convincing to someone else—even someone who initially disagrees with your answer.

**Extensions:** Invent some extensions or variations to the problem. That is, write down some related problems. They can be easier, harder, or about the same level of difficulty as the original problem. (You don’t have to solve these additional problems.)

**Evaluation:**

**Option A:** Begin the process to write a *specific rubric* for assessing this mathematical task as if you were to use it in a high school classroom. Determine whether you wish to write a *holistic rubric*, or an *analytic rubric*.<sup>1</sup> At minimum, create a statement(s) to define the rubric level *Meets Expectations*.

**Option B:** Discuss your personal reaction to the problem. For example, you might respond to questions such as:

- Did you consider it educationally worthwhile? What did you learn from it?
- How would you change the problem to make it better?
- Did you enjoy working on it?
- Was it too hard or too easy?

**Grading:** Scored based on completion of the task specifics, and the quality of the response. Do not simply write an essay describing what an observer of your work may say. Rather, write a mathematical paper. State your ideas, conjectures, findings, justifications... Focus more on demonstrating your representations of your ways of thinking, than carefully crafted sentences that might be evaluated by an English teacher. I expect to see symbols, tables, pictures...

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<sup>1</sup> Class, or other course resources may provide these definitions/distinctions (for example, an article by Stutzman & Race: *EMRF – Everyday Rubric Grading*). If not, do a little research to learn the difference.