

# SECONDARY MATHEMATICS EDUCATION

EDSS 543 A/B – FALL 2002

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The mission of the College 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..

## REQUIRED MATERIALS:

- California Department of Education (1999). Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve. Sacramento, CA: author. This document can be found on the WWW at: [http://www.cde.ca.gov/board/mcs\\_intro.html](http://www.cde.ca.gov/board/mcs_intro.html) (I highly encourage students to purchase this publication).
- National Council of Teachers of Mathematics (2000). Principles and standards for school mathematics. Reston, VA: author. This document can be found on the WWW at: <http://standards.nctm.org/>
- Star Test Blueprints for Standards Items (<http://www.cde.ca.gov/statetests/star/s2blueprt.html>)
- Wilson, P.S. (Ed.). (1993). Research ideas for the classrooms: High school mathematics. New York: Macmillan.

## COURSE DESCRIPTION:

Learning to teach mathematics well is difficult and this course will not complete your education in learning how to teach mathematics. This course is but one stage in what I hope will be a continuing evolution of you as a mathematics teacher. The focus of this course will be on (1) developing an understanding of the current practices in mathematics, (2) learning to teach content specific concepts using effective and appropriate strategies, and (3) practicing how to teach for mathematical understanding. Enfolded into this course will be curriculum development, developing an understanding of children's content specific thinking, creating a classroom environment that promotes the investigation and growth of mathematical ideas, and developing strategies to ensure the success of all students in multi-cultural settings.

### Standard Alignment:

The course objectives, assignments, and assessments have been aligned with the CTC standards for the Single Subject Credential in Mathematics. The following standards are a primary emphasis in this course:

- Standard 3: Relationship between Theory and Practice
- Standard 4: Pedagogical Thought and Reflective Practice
- Standard 5: Equity, Diversity and Access to the Core Curriculum for All Children
- Standard 8B(a): Pedagogical Preparation for Subject-Specific Content Instruction by SS Candidates (Mathematics)

### Teacher Performance Expectation (TPE) Competencies:

This course is designed to help teachers seeking a Single Subject Credential in Mathematics to develop the skills, knowledge, and attitudes necessary to assist schools and district in implementing an effective program 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 TPE's are addressed in this course:

#### Primary Emphasis:

- TPE 1b-Subject Specific Pedagogical Skills for SS Teaching (Mathematics)
- TPE 2-Monitoring Student Learning During Instruction
- TPE 3-Interpretation and Use of Assessments
- TPE 4-Making Content Accessible
- TPE 6c-Developmentally Appropriate Practices in Grades 9-12

#### Secondary Emphasis:

- TPE 5-Student Engagement
- TPE 6b-Developmentally Appropriate Practices in Grades 4-8
- TPE 6d-Developmentally Appropriate Practices for Special Education
- TPE 6e-Middle Level Philosophy and School Organization
- 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

### **KEY ASSIGNMENTS:**

Reading Reflections (20%) – Every other meeting students will write a "meaningful" one page reflection on the articles assigned to be read for that period. These do not need to be formal or greater than one page in length, rather the emphasis should be on your reflection and thought process.

Student Interviews (20%) - You and one of your classmates will conduct a student interview based on questions we create in class. The purpose of this activity is to get you 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.

Mathematical Resources & Lesson (40%)– Working in small groups, your team will first compile resources on a predetermined mathematical topic (20%) and then design a lesson that you will present in an elementary class (or ours as if we were your students) (20%). The purpose of this activity is to help you learn how to design effective mathematical activities, to provide you with an opportunity to begin compiling mathematical resources, and to provide an opportunity for you to practice teaching mathematics.

Curriculum Assignment (20%)– Students will review the mathematics curriculum currently being used in their classroom (e.g., a textbook) at one grade level and write a short paper that investigates the curriculum alignment with the CA Content Standards and current high stakes assessments. Students will also provide their general thoughts and concerns related to the curriculum (e.g., how the curriculum might need to be altered to make strong connections between mathematical concepts and procedures).

**GRADING SCALE:**

Grades will be based on the following grading scale:

- A.....90 -100%
- B.....80 - 89%
- C.....70 - 79%
- D.....60 - 69%
- F.....Below 60%

**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.

**STUDENTS WITH DISABILITIES REQUIRING REASONABLE ACCOMMODATIONS:**

Students are approved for services through the Disabled Student Services Office (DSS). This office is located in Craven Hall 5205, 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.

**ATTENDANCE POLICY:**

The attendance policy of the College of Education: Due to the dynamic and interactive nature of course in the COE, 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. If you miss two class sessions or are late (or leave early) more than three sessions, you cannot receive a grade of "A". If you miss three class sessions, your highest possible grade is a "C+". Should you have extenuating circumstances, contact the instructor as soon as possible. Please discuss with me any extenuating circumstances that will cause you to miss class prior to your absence. Attendance will be taken at each class session. Furthermore, grades on assignments turned in late will be lowered unless prior arrangements have been made with the instructor.

**PLAGIARISM AND CHEATING:**

Please be sure to read and understand the university policy on plagiarism and cheating as it will be strictly enforced. Academic dishonesty will not be tolerated and will result in a failing grade for this course and will be reported to the University.

**SB2042 – AUTHORIZATION TO TEACH ENGLISH LEARNERS COMPETENCIES**

<b>TEST 1: LANGUAGE STRUCTURE AND FIRST- AND SECOND-LANGUAGE DEVELOPMENT</b>	<b>TEST 2: METHODOLOGY OF BILINGUAL, ENGLISH LANGUAGE DEVELOPMENT, AND CONTENT INSTRUCTION</b>	<b>TEST 3: CULTURE AND CULTURAL DIVERSITY</b>
<b>I. Language Structure and Use: Universals and Differences (including the structure of English)</b>	<b>I. Theories and Methods of Bilingual Education</b>	<b>I. The Nature of Culture</b>
<b>A.</b> The sound systems of language (phonology)	<b>A.</b> Foundations	<b>A.</b> Definitions of culture
<b>B.</b> Word formation (morphology)	<b>B.</b> Organizational models: What works for whom?	<b>B.</b> Perceptions of culture
<b>C.</b> Syntax	<b>C.</b> Instructional strategies	<b>C.</b> Intragroup differences (e.g., ethnicity, race, generations, and micro-cultures)
<b>D.</b> Word meaning (semantics)	<b>II. Theories and Methods for Instruction In and Through English</b>	<b>D.</b> Physical geography and its effects on culture
<b>E.</b> Language in context	<b>A.</b> Teacher delivery for <u>both</u> English language development <u>and</u> content instruction	<b>E.</b> Cultural congruence
<b>F.</b> Written discourse	<b>B.</b> Approaches with a focus on English language development	<b>II. Manifestations of Culture: Learning About Students</b>
<b>G.</b> Oral discourse	<b>C. Approaches with a focus on content area instruction (specially designed academic instruction delivered in English)</b>	<b>A. What teachers should learn about their students</b>
<b>H.</b> Nonverbal communication	<b>D.</b> Working with paraprofessionals	<b>B. How teachers can learn about their students *</b>
<b>II. Theories and Factors in First- and Second-Language Development</b>	<b>III. Language and Content Area Assessment</b>	<b>C. How teachers can use what they learn about their students (culturally responsive pedagogy)*</b>
<b>A.</b> Historical and current theories and models of language analysis that have implications for second-language development and pedagogy	<b>A. Purpose</b>	<b>III. Cultural Contact</b>
<b>B.</b> Psychological factors affecting first- and second-language development	<b>B. Methods *</b>	<b>A.</b> Concepts of cultural contact
<b>C.</b> Socio-cultural factors affecting first- and second-language development	<b>C. State mandates</b>	<b>B.</b> Stages of individual cultural contact
<b>D.</b> Pedagogical factors affecting first- and second-language development *	<b>D. Limitations of assessment</b>	<b>C.</b> The dynamics of prejudice
<b>E.</b> Political factors affecting first- and second-language development	<b>E. Technical concepts</b>	<b>D.</b> Strategies for conflict resolution
		<b>IV. Cultural Diversity in U.S. and CA</b>
		<b>A.</b> Historical perspectives
		<b>B.</b> Demography
		<b>C.</b> Migration and immigration

<b>Session Number and Topic *(2 sessions each Sat)</b>	<b>Assignment to be Completed BEFORE Class Session</b>
1. Introduction to Mathematics Education	
2. Developing Mathematical Understanding	Chapter 1 & 5 (skim)
3. Problem Solving	Chapter 3 & 4
4. Standards	NCTM Standards Assignment
5. Lesson Study & Working Groups	Assigned Readings: ( <a href="http://www.lessonresearch.net">http://www.lessonresearch.net</a> )
6. Instructional Practices	Chapter 12 & 13
7. Assessment & Conducting Student Interviews	
8. Technology	Chapter 11
9. General Math Topics	Chapter 6
10. General Math Topics (Cont)	
11. Algebra	Chapter 7
12. Algebra (Cont)	
13. Geometry	Chapter 8
14. Advanced Math Topics	
15. Affective Issues/Wrap-up	Chapter 2

\*This schedule is an **APPROXIMATION**. Given the nature of this course, we will likely be altering the schedule in order to accommodate student interest, observe and teach in mathematics classrooms, and take advantage of professional development opportunities.

## STUDENT INTERVIEW GUIDELINES

EDSS 543—Fall, 2002

Student interviews are designed to provide students with opportunities to focus on a single child's thinking about mathematics. It will also help students to improve their use of inquiry for assessment purposes and to better understand middle level students with different understandings.

I recommend that students work together with a partner on these interviews. As a pair, you would interview one child for each content interview and together write up your evaluation of the student (please also submit the child's written work attached to your paper).

### Prior to the interview

- You should arrange with a teacher (or parent of a child you know) to interview one child for 20-30 minutes in a quiet place outside the classroom, if possible.
- Provide the teacher with some understanding of what the interview will contain and see if he/she has any thoughts about how this child will do on the assessment.
- Develop a list of questions you may want to use if the child is not forthcoming with a response. For example, if the child says "I just knew it", you might respond with "What did you think about first?" or "If you were helping a friend, how would you explain what you did?"

### During the interview

Work with the child individually. Begin the interview by informing the child that you will be giving him/her 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 end early then please find another willing student). Do everything you can to help make the child comfortable.

Orally provide the child with each problem, posing them one at a time, you received from class and provide him/her with sufficient time to complete each problem. You may also want to provide the child with a written copy of each problem.

After the child answers each problem you should ask a variety of questions that will help you to better understand the child's thinking and to assess his/her mathematical understanding. **You will want to note the questions you ask and the child's responses** and 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").
- Be careful to respond similarly to correct and incorrect answers. Be curious about all solution strategies -- not just the ones leading to incorrect solutions.
- Your primary role is to listen. Make sure you allow enough "wait time" -- children need time to think before answering.
- Make sure the child feels comfortable during the entire interview. If the child clearly cannot answer a problem, move on to the next problem. 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. If you cut an interview short because of student difficulty, be sure to discuss your reasoning in your write-up.

### **After the interview**

You (and your partner) should **together** write no more than a two page reflection that includes a brief discussion on each of the following two 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 am looking for more of an explanation than just your student could or couldn't solve a particular problem.
- What **specifically** might you do for this child if you were his/her teacher? Here you might want to include discussions about such issues as curriculum, instructional strategies, etc.

### **Grading:**

Each interview will be worth a total of 10 points (20 points (or 20%) total). More specifically, I will be looking for nicely written papers that clearly and specifically express what you learned about: 1) the child's mathematical understanding and 2) what you would do next for this child if you were his/her teacher (again be specific here). For example, you might recognize that this student lacks a conceptual understanding of variable – so as this child's teacher you might want to pose meaningful problems that help to develop an understanding of expressions, etc.

\*NOTE: When you turn in your write-up, you should also include the child's written work (if it exists) and without the student's name listed.

## MATHEMATICAL RESOURCES ASSIGNMENT

EDSS 543--Fall 2002

In preparation for your ‘Designing and Teaching a Lesson in Mathematics’ assignment, your "content group" will construct an Annotated List of Resources that your fellow colleagues will find helpful when teaching your mathematical topic to students. Your list should include resources that directly relate to your mathematical topic (e.g., algebra, geometry, etc.). For example, teacher support materials, manipulatives, WWW locations, research articles, videos or movies, software, etc. Please include any useful information that you find when researching your topic so that your colleagues can learn from your work (but do not include specific pages from teacher workbooks, web sites, etc., rather provide citations along with short descriptions of your resources). I will be looking to find well-constructed packets of information. If you partition the workload it should not be an overwhelming task. If each group prepares a packet of resources and we share that information with each other, then by the end of this course you will each have a wealth of information on some of the most important mathematical topics for use when you teach! A general "rule of thumb" might be for your group to try and find 10 resources in each of the areas mentioned. Some topics will naturally have more resources than other topics.

Your group will submit one nicely prepared copy of your List of Resources on the day of your group presentation (the day your topic is discussed in class). Your group should also be prepared to make a 5 minute presentation that highlights some of the resources you found (consider bringing in a few of the items that you found most helpful when planning your presentation and resources for these materials).

This project is purposefully open-ended in the hopes that you will go out and find some great resources for your mathematical topic and for your presentation. You should talk with your master teachers, use the internet, and make use of materials that I will provide. However, if you have any questions or challenges finding resources, please be sure to ask (I am happy to provide support...I want these to be good so they are good resources)!



## DESIGNING & TEACHING A LESSON IN MATHEMATICS

EDSS 543 -- Fall 2002

Students will participate in small groups (approximately four to six students) to design, construct, and teach a single lesson on an assigned mathematical topic. The lesson will be designed for use with students in a specific course. The purpose of this activity is to help you learn how to design effective mathematical lessons for a specific group of students, learn where to find mathematical resources, provide you with an opportunity to practice teaching mathematics and to receive feedback, and to learn how to effectively collaborate with colleagues in order to improve your teaching.

### Plan of Action:

When planning your lesson, each group should:

1. Clearly identify the objective(s) of your lesson within the context of the overall goals and objectives of the unit. Similar to the Japanese Lesson Study process, your group might also want to identify a specific problem or issue that needs resolution.
2. Identify students' prior knowledge before making decisions about curriculum and instructional practices.
3. Consider whether your curriculum clearly brings forward your mathematical objective(s) and what, if any, alterations are necessary. Furthermore, your lesson must be consistent with the Mathematics Framework for California Public Schools (e.g., Content Standards).
4. Each group will be required to meet with me at least one time prior to the date of your presentation (this is not to say that we can only meet once!). One of the primary purposes of this activity is to provide me with an opportunity to work with each of you on a more individual basis so that I can help you learn to design effective mathematical activities. I will be happy to provide you with suggestions after you have given it some thought.
5. Make sure that each member of the group participates fully in the design and implementation of the lesson and that the workload is shared equitably. As part of your written report, each member must include a short written evaluation that describes the contributions made by each member of the group (indicating whether the workload was shared fairly among the members of the group).
6. On the day your topic is to be discussed in class, your group will turn in a lesson plan for your activity (using the format discussed in your Curriculum & Instruction Course), a reflection of your group's collaboration process and the teaching of your lesson, and a paragraph from each member that describes how the workload was shared. Each group will email a copy of your lesson plan and mathematical resources to each of your classmates for their teaching files.
7. Each group will either show a short snippet of your actual lesson to the class for discussion or will allow others to observe the actual lesson (we will discuss the options).

### **Grades:**

For this activity, which will be worth a total of 20 points (20%), I am as interested in the process your group goes through as much as the final product. I want this to be an opportunity for you to learn such things as where to go for mathematical resources, to learn how to prepare lesson plans and what to consider when writing a lesson plan, to recognize the many challenges of teaching mathematics, to learn how to reflect and critique lessons, and to begin to understand the importance of on-going professional development opportunities. Your grade on this assignment will be based on the following:

- The design of your lesson plan. For example, adheres to identified lesson plan format described in your Curriculum and Instruction course, adheres to the California Content Standards, makes good use of student thinking, is grade appropriate, is sensitive to the needs of all students, and includes a plan for assessment, etc.
- The level of collaboration among the members of your group, the depth of your reflections (collaboration and teaching of the lesson), and what you learned from this process. You must be willing to take risks, commit yourself fully to this process, and desire to learn as much as possible from others and from the process. The success of this lesson depends on how much YOU put into this activity!
- As discussed earlier, each member of the group will need to include a short paragraph that describes how the work was shared among the members of the group (was the work shared fairly?). If the overall group identifies one member that did not fairly contribute to the final product then I will likely lower the grade of that individual (please work together and share the workload).
- Although the actual presentation of the lesson will NOT be factored into your grade, each group will receive feedback. I believe that this is a time for you to try things out and to make mistakes, not to be judged. Don't be afraid to take some risks and to make mistakes.

**\* If anything is unclear or if you ever have questions, please ASK me.**

## **CURRICULUM ANALYSIS**

EDSS 543 – Fall 2002

Curriculum Assignment (20%) – Students will review at least one chapter or unit from the mathematics curriculum currently being used in a mathematics classroom (e.g., a textbook) and write a short paper that investigates the curriculum as well as its alignment with the CA Content Standards and current high stakes assessments. Students must provide supporting evidence from various resources (e.g., CA Content Standards, course materials, etc.) and provide their general thoughts and concerns related to the curriculum (e.g., how the curriculum might need to be altered in order to make strong connections between mathematical concepts and procedures).

This assignment is designed to give you an opportunity to closely examine mathematics curriculum currently being used in schools and identify how it might need to be altered to better meet the needs of your students given the goals of your mathematics program. You and a partner will select the mathematics curriculum at a specific grade level to examine. This assignment will be more meaningful if you are able to use the mathematics curriculum you will be teaching from during your student teaching assignment or the curriculum you will be teaching from for the lesson study assignment). Each pair will submit a 4-6 page written report (6 pages max) focused on your analysis of the curriculum. The following questions are provided to help you focus your analysis – you do **NOT** need to specifically address each of the bulleted questions!

### **Some key questions you might include in your evaluation:**

- Is this curriculum compatible with the new California Content Standards?
- Does this curriculum develop students’ procedural knowledge, conceptual knowledge, or a “bridge” between the two?
- What are the greatest strengths of this curriculum?
- What concerns do you have about this curriculum?
- If you were to teach from this curriculum, how specifically might you supplement the curriculum in order adequately prepare your students?
- What kind of instructional practices are encouraged? Do you agree?
- Would you recommend that your district adopt and use this curriculum?

### **Grading:**

This assignment will be worth 20 points (or 20% of your overall grade). I will be looking for reports that are insightful, specific, provide supporting documentation to support their thoughts, and are nicely written. I want your analysis to include some discussion related to how well your curriculum addresses the new California Content Standards (you will need to go beyond what the textbook says about the content standards!) and provide your personal analysis of the curriculum based on what you want students to learn from your math class (what do you want students to learn on this topic and will this curriculum get students to that point?). Be specific and give examples whenever possible to support your position.