

CALIFORNIA STATE UNIVERSITY SAN MARCOS COLLEGE OF EDUCATION

EDMS 543B – Mathematics Education in Elementary Schools

CRN 21053, Section 01, 3 Units, Spring 2011

Wednesday 13:00-15:45, Room KEL 1111

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College of Education Mission Statement

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 ongoing service. Our practices demonstrate a commitment to student-centered education, diversity, collaboration, professionalism, and shared governance. (Adopted by the COE Governance Community October, 1997)

Course Description and Objectives

EDMS 543B focuses on how children develop mathematical understanding; children's mathematical thinking, curriculum development; methods, materials, planning, organization and assessment in various elementary school curricula; and curriculum integration. Methods of cross-cultural language and academic development are integrated into the course.

Learning to teach mathematics well is challenging and, therefore, this course will only begin your education in learning how to teach mathematics. This course is but one stage in your process of becoming a mathematics teacher. We are expected to: (a) deepen our understanding of the mathematics taught at the elementary level, including such topics as place value, base systems, number theory, fractions, proportions, statistics, and algebra, (b) develop an understanding of the current issues and practices in mathematics education, (c) develop a familiarity with the NCTM and California learning standards, (d) develop an understanding of children's content specific thinking, (e) learn to teach content specific concepts using effective and appropriate strategies, including the educational use of technology, (f) practice how to teach for mathematical understanding, (g) understand the nature, purposes, and application of mathematics assessment and its relationship with teaching and learning, and (g) develop strategies to create a classroom environment that promotes the investigation and growth of mathematical ideas and to ensure the success of all students in multi-cultural settings.

Course Prerequisites

- Admission to the Integrated Credential Program (ICP)

Required Materials

- Van de Walle, J. A., Karp, K. M., and Bay-Williams, J. M. (2010). *Elementary and middle school mathematics: Teaching developmentally* (7th ed). Boston: Pearson Education, Inc.
- California Department of Education (2005). *Mathematics framework for California public schools: Kindergarten through grade twelve*. Sacramento, CA: Author. This document can be found at <http://www.cde.ca.gov/ci/ma/cf/index.asp>.
- Several other readings may be required and will be available for download.

You are required to access the following Web sites and materials for this course:

- National Council of Teachers of Mathematics (2000). *Principles and standards for school mathematics*. Reston, VA: Author. An overview of this document can be found at: <http://standards.nctm.org/document/index.htm>
- Star Test Blueprints for Standards Items (grades 2-7) <http://www.cde.ca.gov/ta/tg/sr/documents/math1105.doc>

Recommended Materials

- Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (1999). *Children's mathematics: Cognitively guided instruction*. Portsmouth, NH: Heinemann.
- Carpenter, T. P., Franke, M. L., & Levi, L. (2003). *Thinking mathematically: Integrating arithmetic & algebra in elementary school*. Portsmouth, NH: Heinemann.
- Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven, CT: Yale University Press.
- Burns, M. (2007). *About teaching mathematics: A K-8 resource 3rd Ed.*. Sausalito, CA: Math Solutions Publications.

Authorization to Teach English Language Learners

The CSUSM 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 SB2042 Program Standards, August 2002*)

Teacher Performance Expectation (TPE) Competencies

The course objectives, assignments, and assessments have been aligned with the CTC standards for Multiple Subject Credential. This course is designed to help teachers seeking a California teaching credential 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.

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, COE 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 COE website: <http://www.csusm.edu/coe/CalTPA/ProgramMaterialsTPA.html>

CSUSM Writing Requirement

The CSUSM writing requirement of 2500 words is met through the completion of course assignments. Therefore, all writing will be looked at for content, organization, grammar, spelling, and format.

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 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

Due to the dynamic and interactive nature of courses in the College 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*).

If you miss two sessions, you will not receive a grade of A. If you miss three sessions, your highest possible grade is a B. If you miss four sessions, your highest possible grade is a C+. If you miss more than four sessions, you will receive a grade lower than a C+, which is considered to be unsatisfactory in a credential program. 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.

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.

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>. If there are questions about academic honesty, please consult the University catalog.

<http://www.ced.ca.gov/ta/tg/sr/blueprints.asp>

Assignments and Requirements

Each written assignment is expected to have a clear organizational presentation and be free of grammar, punctuation and spelling errors. There will be a reduction in points for the above mentioned errors. Late assignments may not be accepted. Prepare carefully for class, be ready to discuss readings and assignments thoughtfully and actively participate in all class activities.

Participation and Professionalism (10 points) – You are expected to actively participate in discussions, group work, presentations, and hands-on activities throughout the course. A positive professional disposition includes a willingness to consider and discuss new ideas objectively, curiosity, perseverance, and seriousness about improving one's self as a teacher. It can also include a sense of humor and social intelligence (e.g., the tact and ability to make others feel comfortable and to contribute).

Reflection Papers and Classroom Activities (20 points)

The first reflection paper pertains to your prior experience with mathematics.

You will either:

- 1) Write a "meaningful" reflection paper on (a) the text material assigned to be read for that week, or (b) a pressing issue in mathematics education per the instructor's guidelines.

OR

- 2) Engage in classroom activities that are designed for students to demonstrate their understanding and share your thoughts.

Each paper should clearly articulate your thoughts on the assigned readings. In your reflections, you are encouraged to make connections with your teaching/learning experience and your field experience (e.g., your observation of elementary school classroom activities). You can also raise questions for discussion and/or discuss how you might specifically apply what you learned from the readings as a teacher in the classroom. Do not repeat verbatim from the textbook. Other written assignments may be given that will substitute the written reflection but not the reading assignment.

CA Mathematics Standards Oral Presentation (5 points) – Using the *Mathematics Framework for California Public Schools K-12*, you and your group of 2 to 3 other students will select one grade level of standards from *The California Mathematics Content Standards* as a topic for exploration (note that this is Chapter 2 of the *Mathematics Framework for California Public Schools K-12*). Give an oral presentation on your chosen mathematical strand (Number Sense; Algebra and Functions; Measurement and Geometry; Statistics, Data Analysis, and Probability; or Mathematical Reasoning) and the standards for your selected grade and strand, including one relevant example of how **one of the standards in that strand** could be addressed. Since children’s learning with understanding is the focus of this course, it is important that your colleagues are presented with examples that promote mathematical understanding and conceptual development.

Mathematics Learning Center Activity (10 points) – The class will form groups of 5-6 members, and each group will select a mathematical area in the elementary school curriculum. Each group member needs to design a 5-10 minute learning activity in the assigned area and then teach the activity to our EDMS 543B class. In addition, you need to write a detailed description of the learning activity and provide teaching tips for your activity (so that, for example, a substitute teacher can follow). You need to go through the activity checklist (will be provided in class) and ensure that the activity is appropriate and beneficial to the class.

Student Interviews (20 points) – You need to conduct two interviews to assess students’ understanding of mathematics. Sample interview questions are provided, but you are encouraged to use your own invention. You need to choose two mathematical topics from the following six areas: (1) number concepts, (2) addition/subtraction, (3) multiplication/division, (4) fraction, (5) measurement/geometry, and (6) algebra. The purpose is to get you to begin thinking about students’ mathematical understanding, to learn how to effectively pose questions and interpret the meaning of students’ responses, and to provide you with an opportunity to interact with students. For each interview, you need to submit a 3-page report. You can work with a peer in the interviewing process, but each needs to write his/her own report. In addition, you may need to share/present your interview findings in class. See the Student Interview Guidelines and a sample interview report on WebCT.

Mathematics Lesson Design (35 points) – The purpose of this assignment is to help you learn how to design effective mathematical activities and lessons and to provide an opportunity for you to practice teaching mathematics. Working in small groups of 3-4 members, your team will design one standard-based lesson (approximately 40 minutes) that you will present in an elementary school class. While the lesson plan is group work, each of you needs to implement the lesson at the school you are observing. In addition, you need to videotape your teaching of the lesson and reflect on the effectiveness of the lesson. You are encouraged to submit a draft of the lesson for review before the lesson is taught to students. Your teaching performance will not affect your grade. Refer to the lesson design grading rubric and other guidelines here and on the class WebCT.

Detailed information about the assignments will be given in class and/or on the course WebCT. You need to submit the assignments (except children’s work) on the course WebCT. You are responsible for ensuring that assignments are submitted correctly and on time. Late assignments may receive a reduction in points unless **prior arrangements** have been made with the instructor.

Grading Scale

Grades will be based on the following grading scale:

| | | | |
|----------------|----------------|----------------|----------------|
| A = 93% - 100% | A- = 90% - 92% | B+ = 87% - 89% | B = 83% - 86% |
| B- = 80% - 82% | C+ = 77% - 79% | C = 73% - 76% | C- = 70% - 72% |
| D = 60% - 69% | F = below 60 | | |

Lesson Design Elements

Group Members:

Elements of the learning experience

Lesson Title:

Grade Level: _____ **Content Area:** *Mathematics*

Subject Matter: *Number Sense*, *Measurement and Geometry*, *Algebra and Functions*,
 Statistics, *Data Analysis and Probability*, *Mathematical Reasoning*

Time period for the learning experience: *Example: two 30 minute sessions*

California Mathematics Content Standards: *State-adopted content standards*

Lesson objective(s) based on the content standards:

Mathematical Concept(s): What are you trying to teach? What big idea(s) is/are the focus of your lesson? Do not say, "The students will . . ." (That is an objective, not a concept.)

Example: In the set model for fractions, the whole is understood to be a set of objects and subsets of the whole make up fractional parts.

Class Description: For the purpose of this assignment, the class description must include English Learners, Special Education students and GATE students. Individualize this section based on your own assigned classroom.

Type of class (self contained, subject specific), time of year, general background of students learning in relationship to new learning (challenges and prior learning)

English Learners:

Special education:

GATE student:

Regular education:

Key Vocabulary: Mathematical terms that to be identified and defined within this lesson.

Materials/Resources/Technology: What does the teacher need? What do the students need? *Materials should include lists of supplies that will be needed to present this lesson.*

Assessment Plan

Note: Goals/objectives that will be assessed are based on the content standards and are tied to the Big Idea(s) (concepts) in your lesson.

Types of assessment: Prior knowledge (pre assessment), Formative (progress monitoring), Summative (final product)

Description and Purpose of each Assessment Type listed above.

Feedback strategies: How students will be informed of specific successes and challenges?

How general assessment results will be used to inform instruction:

Criteria for Assessment

What benchmark criteria will you use to grade the assessment? How will you know if a student has successfully completed the assessment and accomplished the learning goals? What will they do to show you they have succeeded?

NOTE: Criteria are based on the mathematics content standards and the learning goals/objectives in your lesson.

Lesson Center Activities: Address the subject matter lesson objectives and developmental needs of the students described.

| Instructional Strategies- <i>What the teacher does during the instruction.</i> | Student Activities – <i>What the students do during the lesson.</i> |
|---|---|
| LAUNCH How will you set up the problems or mathematical tasks? How will you motivate and focus students? What will you establish expectations? | |
| EXPLORE How will you help students explore the math concepts in the lesson? How will you promote students' conceptual understanding? How will you check for students' understanding? What difficulties may be seen? What questions can you ask to guide students' thinking? What are the accommodations and modifications for students who may struggle? | |
| SUMMARIZE/SHARE Closure: How will you have students summarize their learning? How will you encourage students to share their learning and provide comments to other students' findings? What questions can you ask to encourage students to draw conclusions? How will you structure opportunities for students to continue developing understanding and skills after the lesson? | |

Description & Purpose of Differentiated/Adapted Instructional Methods for ONE of the following students:

- *English Learner*
- *Learner with Special Needs*
 - *Learning Disability*
 - *Physical Disability*
- *GATE Student/Advanced Learners/Accelerated Learner*

Rationale for Instructional Strategies:

- 1) Why are the instructional strategies, student activities and resources appropriate for this class, based on content and student development?

- 2) How do they help the students make progress toward achieving the state adopted academic content standards in this content area?

LESSON DESIGN ASSIGNMENT GRADING RUBRIC

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| Design Component & Criteria | Approaching | Meets (includes the criteria for Approaching) | Exceeds (includes the criteria for Approaching & Meets) |
|--|---|---|--|
| Part I. Elements of Learning Experience (4 points) | | | |
| Title, Grade Level, & Time 0.3 points | Provides a title that is related to the lesson activity; provides grade level and time allocation ... | & title addresses the math concepts in the lesson; appropriate grade level and time allocation ... | & describes where the title fits within a unit plan. |
| CA Standards and Lesson-specific Learning Objectives 1 point | CA Standards are identified and each is addressed in a learning objective or a set of objectives ... | & each learning objective is clearly stated in terms of what students are expected to know and do ... | & identifies which of the three facets of mathematics learning (procedural proficiency, conceptual understanding, & problem solving) each learning objective is designed to address. |
| List of materials 0.5 points | Provides a list of materials ... | & the materials are appropriate... | & effective materials that help achieve the learning objectives; if uncommon materials are used, describes how to obtain and/or produce them. |
| Math Concepts 0.5 points | Provides a description of the math concepts in the lesson... | & the description is correct and is distinct from a lesson objective... | & the description contains essential math concepts ("big ideas"). |
| Class Description 1.7 points | Provides the class demographic information; describes students' prior knowledge & experience... | & includes developmental needs of the students... | & includes ALL groups of students who present a different instructional challenge (ELL, Special Ed, GATE, etc.) and their particular learning needs. |
| Part II. Assessment Plan (5 points) | | | |
| Assessment Strategies 3 points | Provides assessment strategies for each objective ... | & articulates if each strategy is <i>formative or summative</i> (or other type) assessment; clearly describes what will be assessed and how you will conduct each of the assessment tasks ... | & provides multiple opportunities for the instructor to check for understanding. |
| Criteria & Rubrics 2 points | Provides rubrics for assessing student learning ... | & clearly communicates to students about the expectations ... | & justifies the use of holistic or analytical (or mixed) approach to rubric design. |
| Part III. Instructional Strategies (15 points) | | | |
| The Launch Phase 5 points | Provides an introduction to the lesson ... | & effective introduction that motivates students, challenging/interesting problem(s) that orient student thinking ... | & establishes expectations and provides script for teacher and times for each activity. |

| | | | |
|--|--|---|---|
| The Explore Phase 5 points | Describes how you will help students explore the math concepts in the lesson ... | & details the steps that build students' conceptual understanding (cognitively demanding tasks instead of merely rule-oriented drill); provides hints/assists and questions you might give as students work ... | & provides script for teacher and times for each activity; predicts what might happen, provides accommodations and modifications for students who may struggle. |
| The Summarize Phase 5 points | Describes how you will wrap up the lesson ... | & clearly describes how you will format the discussion of the learning task, what questions will you ask to encourage students to draw conclusions and to extend their thinking, etc. ... | & provides strategies for increase students' reflection and meta-cognition. |
| Part IV. Differentiation Strategies (5 points)-- Choose ONE group of students who present a different instructional challenge such as ELL, GATE, Special education, etc.) | | | |
| Differentiation 5 points | Describes the differentiation strategy for the chosen group of students... | & articulates how the strategy addresses the students identity and developmental needs (readiness, interest or learning profile)... | & provides how the strategy will be assessed for effectiveness and altered if needed. |
| Part V. Rationale & Reflection (6 points) | | | |
| Rationale 3 points | Describes the rationale for teaching this lesson (big ideas, enduring understandings, essential questions) ... | & addresses how the instructional strategies and the student activities are suited to meet the standard(s) and objective(s) of the lesson... | & explains how the assessment is a valid and reliable way to assess student learning. |
| Reflection 3 points | Reflects on what works and what does not work... | & includes an in-depth analysis of students' learning outcomes... | & provides specific and effective strategies for improving the lesson. |

Total: 35 points.

Tentative Schedule

Please note that modifications may occur at the discretion of the instructor.

| Date | Session and Topics | Reading & Assignments |
|------|--|---|
| 1/26 | 1. Building a mathematics learning community Course overview | |
| 2/2 | 2. Developing understanding in mathematics What does “understanding” mean in mathematics? Problem solving in the mathematics classroom. | Van de Walle et al. Chapters 1, 2 Reflection 1 due |
| 2/9 | 3. Lesson Design How do we make decisions about what to teach and how we teach it? How do we sequence the learning activities so that students can learn the intended themes? CA math standards presentations part 1 | Van de Walle et al. Chapters 3, 4 |
| 2/16 | 4. Assessment How do we know whether or not students achieve learning objectives? What are the purposes of different types of assessment strategies? What is our response when students do not learn? CA math standards presentations part 2 Lesson plan workshop (20 min) | Van de Walle et al. Chapters 5, 6 Reflection 2 due |
| 2/23 | 5. Introduction to Cognitively Guided Instruction (CGI) What are some types and structures of math problems? How do students solve problems? How do we help children develop number sense? <i>Math topics: Number concepts</i> Lesson design workshop (30 minutes) | Van de Walle et al. Chapters 8, 9 |
| 3/2 | 6. Project-based teaching & learning How do open-ended math tasks allow students to make connections among math concepts? <i>Math topics: Measurement & geometry</i> | Van de Walle et al. Chapters 19, 20 Reflection 3 activity due |
| 3/9 | 7. Using models for math teaching & learning How do we provide opportunities for hands-on explorations in learning mathematics? How can manipulatives help or fail to help children construct math ideas? <i>Math topics: Number concepts and place value</i> Learning Center Activities- Group 1 presentation** | Van de Walle et al. Chapters 10, 11 |
| 3/16 | 8. (con't) Using models for math teaching & learning Making sense of operations on whole numbers <i>Math topics: Addition, subtraction, multiplication, & division</i> Learning Center Activities- Group 2 presentation** | Van de Walle et al. Chapter 12 Interview due* |
| 3/23 | Spring break | |
| 3/30 | 9. Making connections among math concepts Why are fractions, decimals, & percents different representations of the same quantity? What are some models for fractions? Learning Center Activities- Group 3 presentation** | Van de Walle et al. Chapters 15, 17 Lesson design due |
| 4/6 | 10. Making sense of operations on fractions Do we need common denominators in order to add or subtract fractions? Why do we invert and multiply? Learning Center Activities- Group 4 presentation** Lesson plan presentations | Van de Walle et al. Chapter 16 Fractions interview due* |
| 4/13 | 11. The meaning of the equal sign: Pathway to algebra What are children’s understanding and misunderstanding of the equal sign? How can we improve children’s understanding of the equal sign? Lesson plan presentations | Van de Walle et al. Chapter 18 |
| 4/20 | 12. Developing concepts in data analysis and probability What are the chances? The predictable parking lot maze? How are plots, charts, graphs, and averages used? Lesson plan presentations | Van de Walle et al. Chapters 21, 22 |
| | | |

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| 4/27 | 13. Relational understanding of equality How do children develop understanding of equality? How do we promote a relational understanding of equality? Learning Center Activities- Group 5 presentation** | Van de Walle et al. Chapter 14 |
| 5/4 | 14. Lesson plan presentations | Van de Walle et al. Chapter 18, pp. 348-355 Interview due* |
| 5/11 | 15. Conclusion Lesson plan presentations | Reflection 5 due |

Notes:

* You just need to choose **two** of the six topics for student interviews. **You need to perform and submit at least 1 (one) interview by 3/16. The second interview is due 5/4.**

** Presentation of *Mathematics Learning Center Activities*. After the presentation, you should submit this assignment within a week. For example, if you present an activity on number concepts on 3/9, the description (including some teaching tips) is due by 3/16.

