

# Mathematics Education in Elementary Schools

EDMS 543 Fall, 2001

## Instructor:

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Office Hours: Monday,  
9:45 – 10:45 a.m.

## Class Meets:

Monday, Thursday  
7:00 – 9:45 a.m.  
Room: University Hall 439  
Section: 5  
CRN No: 41210

## Required Texts:

Burns, Marilyn. About Teaching Mathematics, Second Edition, Math Solutions Publications. Sausalito, CA:, 2000.

Hiebert, James, et al. Making Sense: Teaching and Learning Mathematics with Understanding, Heinemann, Portsmouth, NH, 1997.

Coggins, Debra, (Ed.). A Mathematics Source Book for Elementary and Middle School Teachers. Arena Press. Novato, CA:, 1999.

Richardson, Kathy. (1997). Math Time, The Learning Environment. Educational Enrichment, Inc. Norman, OK:

Articles on reserve in the library

## Optional Texts:

Kaplan, Andrew. (1998). Math on Call. Wilmington, MA: Great Source Education Group, Inc.

**Course Description:**

This class focuses on ways to understand children's mathematical thinking and learning and how to facilitate mathematics instruction so that all children are successful. Topics that will be addressed include mathematics curriculum, instructional theory and techniques, materials, and assessment approaches.

Learning to teach mathematics well is difficult. This course will not complete your education in learning how to teach mathematics; it is but one stage in your continuing development as a mathematics teacher. The goal of this course is to help you gain an understanding of the answers to the focus questions and to become familiar with the resources available to you as a teacher.

The instructional content of this course and the assignments are organized to reflect the following dimensions identified as critical to understanding effective mathematics instruction:

- The Role of the Teacher
- The Nature of the Learning Tasks
- The Culture of the Classroom
- Mathematical Tools and Technology
- Equity and Accessibility for All Students

### **Focus Questions:**

These focus questions will serve as a guide throughout the course. They will direct our thinking and study as we learn more about teaching children mathematics. When you complete this course, you should have knowledge, understanding, and experiences that will help you answer these questions.

- 1. How do children develop mathematical understanding, competence, and confidence?**
- 2. How does the culture of the classroom affect mathematical communication and learning?**
- 3. How does the teacher help all children become successful in learning mathematics?**
- 4. How will you continue to develop your mathematical understanding, confidence, and competence?**

### **COURSE REQUIREMENTS:**

#### **Attendance and Participation:**

Punctual attendance and active participation are essential in this class, not only for you to learn, but so that others may benefit from your input. Your final grade in this course will be lowered one half of one letter grade for every absence after your first. Four or more absences may result in a failing grade for this course. Since it is expected that everyone will actively participate in all class sessions, final grades will be lowered for lack of participation. Arriving late or leaving early will be interpreted as lack of participation.

**Note:** If you have extraordinary circumstances in your life that will impact your assignments or attendance, please let me know. Absences for illness and other critical or emergency situations may be excused and will be evaluated on a case-by-case basis. Make-up assignments may be required.

### **Assignments:**

**All written assignments must be typed and double-spaced.** Each assignment is due on the date indicated on the syllabus. Grades on assignments will be lowered by at least one point for each day the assignment is late. After two weeks, the assignment will not be accepted. 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. Assignments (other than reading reflections) may be revised and resubmitted for re-grading up to one week after the assignment has been returned. After one week, no revisions will be accepted.

### **Reading Reflections (20 points)**

**Due: Each class beginning**

Ten 1-2 page reading reflections are required for this course and are due at the beginning of each class meeting. The purpose of this assignment is to prepare you for class discussions by giving you an opportunity to reflect on the reading scheduled for that day. *Therefore, no late reflections will be accepted.* Since there are fourteen readings assigned, you may skip writing up to four reflections to complete the 20 points. Each reflection is worth 2 points. You are still expected to complete all of the assigned readings. For each set of readings, respond to the main ideas of the literature by writing about your ideas, opinions, and experiences as they relate to the topic. Do not summarize the reading; reflect on the issues.

### **Mathematics Web Sites (10 points)**

**Due: Thursday, Aug. 30**

This assignment will give you the opportunity to explore web sites in the area of elementary mathematics education. You will describe three different sites, give your opinion in connection with our class readings and discussions of the information on each, and print an example of what you locate for each site.

### **Teacher Interview Reflection (12 points)** **Due: Thursday, Sept. 13**

This assignment will provide you the opportunity to interview a classroom teacher as to his or her goals and methods for establishing an effective classroom culture for learning mathematics. Questions for the interview will

be discussed in class. After the interview, you will write a paper summarizing and reflecting on the interview and drawing connections to class readings and discussions.

**Classroom Observation Reflection (15 points)      Due: Thurs., Sept. 20**

This assignment is designed to give you an opportunity to observe an elementary classroom in action and make connections to our class discussions and readings. You will make arrangements to visit a local elementary school and observe two mathematics lessons in the same classroom. After your observations, you will write a paper reflecting on the culture of the classroom.

**Student Interview Reflection (15 points)      Due: Thurs., Sept. 27**

This assignment will give you an opportunity to focus on individual children's thinking about mathematics. You will arrange to visit a local elementary school and interview two students about their thinking in mathematics. After the interview, you will write a paper describing the children's ideas and strategies. You should also consider what you would do next in order to continue the children's learning experiences. Based on what you learned in the interview, what would the next steps be for each child? Be sure to make connections to our class readings and discussions.

**Planning and Teaching a Lesson Reflection (18 points)**

**Due: Lesson Plan: Monday, Sept. 17**

**Due: Lesson Plan/Teaching Reflection: Monday, Oct. 8**

You will plan a mathematics lesson including the key components, which you will teach to a small group of students in an elementary class. You will share your lesson plan with a few members of your cohort group in a class discussion and consider the feedback you receive. You will also discuss the lesson plan with the classroom teacher so that you can be sure that it is appropriate to the students and so that arrangements can be made for you to teach the lesson. After teaching the lesson, you will write a reflection on the experience and turn in both the lesson plan and the reflection. Be sure to make connections to our class readings and discussions.

**Literature Connection (10 points) Due: Thursday, Oct. 11**

This assignment is designed to help you begin thinking about children's literature as a resource for teaching mathematics in context. You will select one children's book that you think makes interesting links to mathematics and would enhance students' learning. You will write a brief description of the book, indicate appropriate grade level(s), explain the mathematics connections, and how you would use it. During class you will give a brief presentation to the cohort of your book and the application you suggest. The write up is worth 7 points and the oral presentation is worth 3 points. Bring 30 copies.

**Grading Scale:**

Grades will be based on the following grading scale. You must maintain a B average in your teacher education courses to receive a teaching credential from the state of California.

A = 90-100%

B = 80-89%

C = 70-79%

D = 60-69%

F = Below 60%

**Writing Requirement:**

CSUSM has adopted an all-university writing requirement. In each course, students are required to write at least 2500 words (approximately 10 pages) in essays, exercises, papers or examinations. CSUSM has a free writing center to assist students with their writing projects.

**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. .

**CLAD Emphasis:** In 1992, the College of Education voted to infuse Cross-cultural, Language and Academic Development (CLAD) competencies across the curriculum. The CLAD competencies, which are appropriate, are covered in this course.

### **Written Assignment Criteria**

**The following criteria are suggested for producing quality write ups.**

- Carefully read each assignment and follow all of the directions.**
- Begin with an introduction and end with a conclusion.**
- These assignments are reflections and should show evidence of thoughtful consideration of your opinions, experiences, and connections to our class discussions and readings.**
- Include specific examples and clear explanations.**
- Use appropriate written language, not conversational form.**
- Proofread carefully so that spelling, grammar, and punctuation are correct.**

## **Mathematics Web Sites**

**Assignment Due: Thursday, Aug. 30**

This assignment will give you the opportunity to explore web sites in the area of elementary education mathematics. Select three mathematics web sites to review. First, write a short description of the information located in each site (1 point). After the site description, write about **your opinion of the site in relationship to our class readings and discussions** ( 1 point). Then print a one-two page example of what you found for each site (1 point). Please write a one-page paper for each site.

This assignment is worth 10 points. Your work will be evaluated on the completeness and thoughtfulness of your ideas.

## **Teacher Interview Reflection**

**Assignment Due: Thursday, Sept. 13**

This assignment will provide you the opportunity to interview an elementary classroom teacher as to his or her goals and methods for establishing an effective classroom culture for learning mathematics. Questions for the interview will be discussed in class. After the interview, you will write a 3-4 page paper summarizing and reflecting on the interview and drawing connections to class readings and discussions.

You should ask your teacher if s/he would be willing to talk with you for 20-30 minutes. If so, you should jointly set a time that is convenient. You may also want to ask your teacher if s/he is willing to have the conversation tape-recorded. Tape-recording would allow you to focus more on the conversation and less on note-taking. However, I suggest that even with a tape-recording, you take some notes in case of technical difficulties.

When you meet with your teacher, you should ask the following questions. Be sure to budget your time, so that you can ask all of these questions.



1. What type of classroom culture do you want to create for your students for learning mathematics? (2 points)
2. What do you do to achieve that atmosphere? (2 points)
3. Describe your expectations of each child's role in his/her learning and how do you get these expectations across to the children? (2 points)
4. What types of assessment do you use to determine your students' understanding and progress? (3 points)

**What to Turn In:**

- After your interview, you will write a 3-4 page paper reflecting on your conversation with the teacher. You do not need to repeat the interview but make adequate references to the points the teacher made so that I can understand the comments you make. Make some conclusions about what you think of the teacher's approaches, ideas, etc.
- Include a brief description of the teacher's situation, i.e. grade level, type of school, number of students (1 point).
- **Make connections to our class readings and discussions** (2 points).

**Grading**

This assignment is worth 12 points. Your work will be evaluated on the completeness and thoughtfulness of your comments.

**Classroom Observation Reflection**

**Assignment Due: Thursday, Sept. 20**

This assignment is designed to give you an opportunity to observe an elementary mathematics classroom in action and make connections to our class discussions and readings.

Observing a classroom can be somewhat overwhelming. Therefore, you should focus on these two areas:

**1. Organization (6 points)**

- What is the physical arrangement of the classroom?
- What are some of the routines or procedures that you observed?
- How well did the students seem to follow the routines or procedures?

**2. Communication (6 points)**

- What was communication like among students?
- What was communication like between the teacher and the entire class?
- What was communication like between the teacher and individual students?

**What to Turn In:**

- After your observation, you will write a 3-4 page paper reflecting on what you learned about classroom organization and communication. You should identify specific examples that led you to these conclusions. Try to address all of the bulleted questions below each area heading as these questions are included to help you focus your observation. In your paper, make sure that you go beyond the actual activities of the classrooms. I am interested in how you **interpret** these activities and what you have learned from the experience.
- Include a brief description of the classroom situation, i.e. grade level, type of school, number of students (1 point).
- **Make connections to our class readings and discussions** (2 points).

**Grading**

This assignment is worth 15 points. Your work will be evaluated on the completeness and depth of your discussions.

**Student Interview Reflection**

## Assignment Due: Thursday, Sept. 27

This assignment is designed to give you an opportunity to focus on children's thinking about mathematics. Make arrangements to interview two students, one in grades K-3 and one student in grades 4-6. **Interview questions will be provided during class.**

For 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.

Be careful to respond similarly to correct and incorrect answers. Be curious about all responses.

Your primary role is to listen. Make sure you allow enough "wait time" -- children need time to think before answering.

- \_\_\_\_\_ If you feel that the child is really struggling and frustrated, you may want to adjust the questions or if all else fails, end the interview early.

**Note:** You should not tape-record/video-tape any interview.

### **What to Turn In:**

After your day of interviewing, you will write a reflection about mathematics interviews you conducted. In a 3 to 4 page paper, you will describe:

- what you learned about each child's thinking, i.e. strategies for solving the problem (6 points — 3 for each student)
- what you saw in regards to each child's confidence and attitude about doing mathematics (4 points — 2 for each student)

- what you would plan to teach each child to continue his/her learning on the topic  
(2 points — 1 for each student)

**Be sure to make connections to our class discussions and readings (3 points).**

### **Grading**

This assignment is worth 15 points. Your work will be evaluated on the completeness and thoughtfulness of your comments.

## **Lesson Plan and Teaching Reflection Assignment**

**Assignment Due: Lesson Plan — Monday, Sept. 17, 2001**

**Lesson Plan and Teaching Reflection — Monday, Oct. 8, 2001**

This assignment provides an opportunity for you to experience teaching a mathematics lesson to a small group of elementary children.

### **Arrangements**

You need to consult with the classroom teacher who is providing you with this opportunity. Make arrangements to teach a lesson that complements the instructional plans of that classroom teacher.

- You should plan to teach for about 30 minutes.
- You and the classroom teacher should determine the best group size but you must teach at least 3 children at one time. If possible, you should observe these children before you plan and teach your lesson. These observations will help you identify the children's prior knowledge and means of addressing the needs of all learners in the group.
- Be sure to arrange for a time and place to teach the lesson. This could occur in the classroom or outside of the classroom (in an adjoining space).

## **Plan the Lesson**

**Select one or two mathematics standards that you plan to teach. Then plan a lesson using the lesson plan format provided in class.** Be sure to consider the points below as you develop your ideas.

- As you write the lesson plan, include as much information as is necessary to provide a clear picture to you and someone else. Be sure to describe ways you plan to address the needs of all learners.
- Try to visualize how the lesson will occur so that you can anticipate ways to adjust your lesson plan. You may want to write down these options so that you can remember them more easily if you need to use one or more.
- Remember to focus on what you intend the students to learn.** In your lesson plan, be sure to indicate how you will know what the students have learned. Be sure to specify what you are looking for.
- If possible, share your lesson plan with the classroom teacher, and consider the feedback that may be offered.
- You must bring a lesson plan to class on **Monday, Sept. 17**. You will receive feedback on your lesson plan during our class from your colleagues.

## **Teach the Lesson**

Teach the lesson as planned, making adjustments as you feel necessary.

## **Reflect and Complete the Write-up**

You must turn in a 3-4 page paper describing what happened and your reflections on both the lesson and the effectiveness of the lesson plan. Remember that the lesson plan and the actual lesson may or may not be exactly the same.

You must answer the following questions in your write-up:

- Briefly describe the student group, grade level, etc. (1 point)

- What did the students learn? Was the lesson objective accomplished? (Include a reference to the mathematics standard(s) that you taught.) (2 points)
- How do I know what they learned? (2 points)
- Did I have to make changes or adjustments, and what were they? (1 point)
- What were the students' attitudes about mathematics? Did they show confidence? (2 points)
- If I had the opportunity to work with these students again, what would I do next? (1 point)
- What did I learn from planning and teaching this lesson? (2 points)

**You should make connections to class readings and discussions.** (2 points)

Be sure to include the lesson plan you used with your write-up. (5 points)

### **Due Dates**

Your **lesson plan** is due on **Monday, Sept. 17, 2001**

The **write-up** is due no later than **Monday, Oct. 8, 2001**

### **Grading**

Your assignment will be evaluated on the description and justification of your lesson plan and the completeness and quality of your reflections. This assignment is worth 18 points.

*Good planning and teaching provide for effective learning. Have fun with this opportunity. You will learn a lot even when situations don't turn out exactly as you have planned.*

## **Literature Connections Collection**

**Assignment Due: No later than Thursday, Oct. 11, 2001**

This assignment is designed to help you begin collecting children's literature resources. You will select one children's book that you think makes interesting links to mathematics and would enhance your students' learning. You will write a brief description of the book, indicate appropriate grade levels, explain the mathematics connections (which Mathematics Standards are addressed), and how you would use it. During class you will give a brief (5 minute limit) presentation to the cohort about your book and the application you suggest.

**Grading:** This assignment is worth 10 points. The write up is worth 7 points, and the oral presentation is worth 3 points. Please bring thirty copies of your write-up.

## **Literature Connections Format**

Name:

Book Title:

Author:

Date of Publication and Publisher:

Description of the Book:

Appropriate Grade Levels:

Mathematics Connections (Mathematics Standards):

Ideas for Using the Book:



## COURSE PLAN for FALL, 2001

**Note:** Readings are to be completed by the day they are scheduled.

**1: Thursday, Aug. 23**      **Introduction: Developing  
Understanding, Competence, and  
Confidence**  
**Due:** Survey

**2: Monday, Aug. 27**                      **The Role of the Teacher**

**Reading:**    About Teaching Mathematics, pp. 139-160  
Math Time, Part 1, pp. 3-37  
Making Sense, pp.29 - 41  
**Article:** Burns, M. (February, 1985). The role of  
questioning. Arithmetic Teacher. 14-16.

**Due:** Reading Reflection #1

**3:Thursday, Aug. 30**                      **Children's Mathematical Thinking**

**Reading:**    About Teaching Mathematics, pp.3-28  
Math Time, Part 2, pp. 39-52  
Making Sense, pp.1 - 15  
**Article:** Kamii, C., Lewis, B., Livingston, S.J.  
(December, 1993). Primary arithmetic: Children  
inventing their own procedures. Arithmetic Teacher.  
200-203.

**Due:** Reading Reflection #2                      **Mathematics Web Sites**

**4: Thursday, Sept. 6**                      **Nature of Learning Tasks**

**Reading:**    About Teaching Mathematics, pp. 29-42, 125-135, 297-  
308

A Mathematics Source Book, pp. 2-13

Making Sense, pp. 17 - 27

**Article:** Richardson, K. (April, 1997). Too easy for kindergarten and just right for first grade. Teaching Children Mathematics. 432-437.

**Due:** Reading Reflection #3

**5: Monday, Sept. 10**

**The Culture of the Classroom**

**Reading:** A Mathematics Source Book, pp. . 14-26,  
99-108

Making Sense, pp. 43 – 52; 65 - 74

**Article:** Jacobs, V.R., Bennett, T.R., Bullock, C.R. (May, 2000). Selecting books in Spanish to teach mathematics. Teaching Children Mathematics. 582-587.

**and**

Vacc, N.N. (December, 1993). Teaching and learning mathematics through classroom discussion. Arithmetic Teacher. 225-227.

**Due:** Reflection #4

**6: Thursday, Sept. 13 Communication in a Mathematics Classroom**

**Reading:** A Mathematics Source Book, pp. 37-47

Math Time, Part 3, pp. 53-72

Making Sense, pp. 73 - 127

**Article:** Mumme, J., Shepard, N. (1990). Communication in Mathematics. Arithmetic Teacher, 18-22.

**and**

Wickett, M.S. (May, 1997). Serving up number sense and problem solving: *Dinner at the Panda Palace*. Teaching Children Mathematics. 476-480.

**Due:** Reading Reflection #5

**Teacher Interview**

**7: Monday, Sept. 17**

**Assessment in Mathematics**

**Reading:** About Teaching Mathematics, pp.161-172  
Math Time, Part 4, pp. 73-104

**Article:** Huniker, D.M. (1993). Interviews: A window to students' conceptual knowledge of the operations. In N.L. Webb (Ed.) Assessment in the mathematics classroom: 1993 Yearbook. 80-86.

**Due:** Reading Reflection #6

**Lesson plan**

**8: Thursday, Sept. 20**  
**Value**

**Mathematics: Number and Place**

**Reading:** About Teaching Mathematics, pp. 173-222  
A Mathematics Source Book, pp. 48-58, 109-114

**Article:** Carroll, W.M., Porter, D. (March, 1997). Invented Strategies can develop meaningful mathematical procedures. Teaching Children Mathematics. 370-374.

**Due:** Reading Reflection #7

**Classroom Observation**

**9: Monday, Sept. 24**

**Mathematics: Fractions, Decimals, and Percents**

**Reading:** About Teaching Mathematics, pp. 223-252

A Mathematics Source Book, pp. 59-70, 71-78, 88-98

**Due:** Reading Reflection #8

**10: Thursday, Sept. 27**

**Mathematics: Measurement**

**Reading:** About Teaching Mathematics, pp. 45-58, 253-260

A Mathematics Source Book, pp. 27-36  
Math Time, Part 5, pp. 105-111

**Due:** Reading Reflection #9

**Student Interview**

**11: Monday, Oct. 1      Mathematics: Probability and Statistics**

**Reading:** About Teaching Mathematics, pp. 59-78, 261-271  
**Article:** Seidel, J. D. (December, 1996). Gender, Ninja Turtles, and pizza: Using a classroom database for problem solving. Teaching Children Mathematics. 192-199.

**Due:** Reading Reflection #10

**12: Thursday, Oct. 4                      Mathematics: Geometry and Art**

**Reading:** About Teaching Mathematics, pp. 79-99, 272-283  
**Article:** Battista, M., Clements, D.H. (January, 1998). Finding the number of cubes in rectangular cube buildings. Teaching Children Mathematics. 258-264.  
**and**  
**Article:** Ball, D.L. (Summer, 1992). Magical hopes: Manipulatives and the reform of math education. American Educator. 14-18, 46-47.

**Due:** Reading Reflection #11

**13: Monday, Oct. 8      Mathematics: Algebra, Patterns, and Functions**

**Reading:** About Teaching Mathematics, pp. 112-124, 292  
A Mathematics Source Book, pp. 79-87  
**Article:** Ferrini-Mundy, J., Lappan, G., Phillips, E. (February, 1997). Experiences with patterning. Teaching Children Mathematics. 282-288.

**Due:** Reading Reflection #12

**Lesson plan/reflection**

**14: Thursday, Oct. 11**

**Logic and Discrete Mathematics**

**Reading:** About Teaching Mathematics, pp. 100-111, 285-291  
A Mathematics Source Book, pp. 115-120  
Math Time, pp. 113, 117-125

**Due:** Reading Reflection #13 **Literature Connection**

**15: Monday, Oct. 15**

**Mathematics: Tools and Technology**

**Reading: Articles:** Clements, D.H., Sarama, J. (March, 2000).  
Predicting pattern blocks on and off the computer.  
Teaching Children Mathematics. 458-462. **and**  
Drier, H.S. (February, 2000). Investigating mathematics  
as a community of learners. Teaching Children  
Mathematics. 358-363.

**Due:** Reading Reflection #14



