Mathematics Education in Elementary Schools

EDMS 543 Fall, 2002

Instructor:

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Office Hours: Wednesdays 5:00 - 6:00 p.m.

Class Meets:
Wednesdays:
6:00 — 8:45 p.m.
Room: ACD 404
Section: 12
CRN: 41795

Required Texts:

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

Choate, Joyce. (2000). Successful Inclusive Teaching. Needham Heights, MA: Allyn and Bacon.

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

Van de Walle, John A. (2001) Elementary and Middle School Mathematics. Fourth Edition. New York, NY: Addison Wesley Longman.

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. If you have any concerns, please speak with me about them.

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: Wednesday, Sept. 18**

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: Wednesday, Oct. 2**

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: Wednesday, Oct. 16**

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: Wednesday, Nov. 6**

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: Wednesday, Oct. 30

Due: Lesson Plan/Teaching Reflection: Wednesday, Nov. 20

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: Wednesday, Dec. 4**

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 (California Mathematics Standards), and how you would use it. During class you will give a brief presentation about your book and the application you suggest. The write up is worth 7 points and the oral presentation is worth 3 points. Please 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. (Adopted by COE Governance Community October, 1997)

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

Special Education: Consistent with the intent to offer a seamless teaching credential in the College of Education, this course will demonstrate the collaborative infusion of special education competencies that reflect inclusive educational practices.

Technology: This course infuses technology competencies to prepare our candidates to use technologies, emphasizing their use in both teaching practice and student learning.

COURSE PLAN for FALL, 2002

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

1: Wednesday, September 4, 2002: **Introduction: Developing Understanding, Competence, and Confidence**

Due: Survey

2: Wednesday, September 11, 2002: **The Role of the Teacher**

Reading: About Teaching Mathematics, pp. 3-28
Math Time, Part 1, pp. 3-37
Elementary and Middle School Mathematics, 3-25

Due: Reading Reflection #1

3: Wednesday, September 18, 2002: **Children's Mathematical Thinking**

Reading: About Teaching Mathematics, pp.139-160
Math Time, Part 2, pp. 39-52
Elementary and Middle School Mathematics, 26-39
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: Wednesday, September 25, 2002: **Nature of Learning Tasks**

Reading: About Teaching Mathematics, pp. 29-42, 125-135, 297-308
Elementary and Middle School Mathematics, 40-61
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: Wednesday, October 2, 2002: **The Culture of the Classroom**

Elementary and Middle School Mathematics, 450-464
Math Time, Part 3, pp. 53-72
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 **Teacher Interview**

6: Wednesday, October 9, 2002: **Assessment in Mathematics**

Reading: About Teaching Mathematics, pp.161-172
Math Time, Part 4, pp. 73-104
Elementary and Middle School Mathematics, 62-84
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 #5

7: Wednesday, October 16, 2002: **Mathematics: Number and Place Value**

Reading: About Teaching Mathematics, pp. 173-222
Elementary and Middle School Mathematics, 87-106 and 149-170
Article: Carroll, W.M., Porter, D. (March, 1997). Invented Strategies can develop meaningful mathematical procedures. Teaching Children Mathematics. 370-374.

Due: Reading Reflection #6 **Classroom Observation**

8: Wednesday, October 23, 2002: **FIELDWORK – Class will not meet.**

Reading: **Article**: Buschman, Larry. (December, 2001). Using student interviews to guide classroom instruction: an action research project. Teaching Children Mathematics. 222-227.
and
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.

9: Wednesday, October 30, 2002: **Mathematics: Fractions, Decimals, and Percents**

Reading: About Teaching Mathematics, pp. 223-252
Elementary and Middle School Mathematics, 209-242

Due: Reading Reflections #7 and #8 **Lesson Plan**

10: Wednesday, November 6, 2002: **Mathematics: Measurement**

Reading: About Teaching Mathematics, pp. 45-58, 253-260
Elementary and Middle School Mathematics, 277-305
Math Time, Part 5, pp. 105-111

Due: Reading Reflection #9 **Student Interview**

11: Wednesday, November 13, 2002: **Mathematics: Probability and Statistics**

Reading: About Teaching Mathematics, pp. 59-78, 261-271
Elementary and Middle School Mathematics, 352-383
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: Wednesday, November 20, 2002: **Mathematics: Geometry and Art**

Reading: About Teaching Mathematics, pp. 79-99, 272-283
Elementary and Middle School Mathematics, 306-351
Article: Battista, M., Clements, D.H. (January, 1998). Finding the number of cubes in rectangular cube buildings. Teaching Children Mathematics. 258-264.

Due: Reading Reflection #11 **Lesson Plan/Teaching Reflection**

13: Wednesday, November 27, 2002: **FIELDWORK – Class will not meet.**

Reading: Elementary and Middle School Mathematics, 437-449
Successful Inclusive Teaching, chapters 10 and 11

14: Wednesday, December 4, 2002 **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 Reflections #12 and #13 **Literature Connection**

15: Wednesday, December 11, 2002 **Mathematical Reasoning**

Reading: About Teaching Mathematics, pp. 100-111, 285-291
Math Time, pp. 113, 117-125
Article: Ball, D.L. (Summer, 1992). Magical hopes: Manipulatives and the reform of math education. American Educator. 14-18, 46-47.

Due: Reading Reflection #14

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.**
- **All of 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: Wednesday, September 18, 2002

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. Write a one page paper for each site. 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 to two page example of what you found for each site (1 point).

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

Teacher Interview Reflection

Assignment Due: Wednesday, October 2, 2002

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? How do you accommodate children with special needs? (3 points)**

4. What types of assessment do you use to determine your students' understanding and progress? (2 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: Wednesday, October 16, 2002

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)

- Describe the physical arrangement of the classroom.
- Describe 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)

- Describe the communication among students.
- Describe the communication between the teacher and the entire class.
- Describe the communication 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 points below each area heading as these directions 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: Wednesday, November 6, 2002

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 the interviews, write a 3-4 page reflection about the following points:

- 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 — Wednesday, October 30, 2002
Lesson Plan and Teaching Reflection — Wednesday, November 20, 2002

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 on page 11 of the syllabus. 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 **Wednesday, October 30, 2002.** 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 **Wednesday, October 30, 2002.**
The **write-up** is due no later than **Wednesday, November 20, 2002.**

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.

Essential Lesson Plan Components

1. **Student Group:** grade level, number of students, learning level(s)

2. **Lesson focus:**

   - What do I want my students to learn? Include a reference to the specific mathematics standard that you are teaching.

3. **Connections to other learning:**

   - What do students need to know prior to this lesson, and how am I going to connect this lesson to what the students already know?

   - How does the lesson fit with the other lessons in the unit?

4. **Instruction – the plan for the lesson:**

   - What teaching strategies will I use? (e.g. direct instruction, cooperative learning, discussion, etc.)

   - How will I be sure to address the needs of all learners? (e.g. English language learners, students who are eligible for Special Education, GATE students, etc.)

     (e.g., vocabulary development, active student participation, use of support materials, student groupings, etc.)

   - How will I pace the lesson? (e.g., timing, order of activities, etc.)

5. **Assessment – checking for understanding:**

   - How will I check for understanding during the lesson?

   - Will I check for understanding at the conclusion of the lesson, and if so how?

6. **Materials needed:**

   - What materials do I need to teach this lesson? (e.g., realia, manipulatives, visuals, graphics, etc.)

   - Where will I put the materials and how will they be handed out and collected?

Literature Connections Collection

Assignment Due: No later than Wednesday, December 4, 2002

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 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*:*