

Mathematics Education in Elementary Schools

EDMS 543 Spring, 2003

Instructor:

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Office Hours: Tuesday, Friday
12 - 1 p.m.

Class Meets:

Tuesday, Friday
1 - 3:45 p.m.
Room: UH 441
CRN No: 21721

Required Texts:

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

Choate, Joyce. Successful Inclusive Teaching, Third Edition, Allyn and Bacon, Needham Heights, MA. 2000.

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

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

Mathematics Framework for California Public Schools. California Department of Education. 2000. (available online).
<http://www.cde.ca.gov/board/pdf/math.pdf>

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?**
- 5. How does the teacher analyze the curriculum in relation to State mathematics standards?**

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. A good student is one who adheres to standards of dependability and promptness. **If you miss more than two class sessions or are late (or leave early) for more than three sessions, you cannot receive an A. If you miss more than three class sessions you cannot receive a B.** Late assignments will be penalized by a 10% deduction in points for each weekday late. After one week, late assignments will be given a zero.

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 questions or concerns, please feel free to come in and 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 10% for each day the assignment is late. After one week, 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 (40 points – 4 points for each reflection)**
Due: Each class beginning

A 1-2 page reading reflection is required for 10 sets of reading assignments and is 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 14 readings assigned, you may skip writing up to 4 reflections to complete the 40 points. You are still expected to read and think about each of the assigned readings. Each reflection is worth 4 points. 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 (20 points) Due: Tuesday, Jan. 28**

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.

Then print a one-two page example of what you found for each site. Please write a one-page paper for each site.

This assignment is worth 20 points. Your work will be evaluated on the completeness and thoughtfulness of your ideas.

- **Teacher Interview Reflection (20 points)** **Due: Friday, Feb. 7**

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 2 - 3 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. What do you do to achieve that atmosphere?
3. Describe your expectations of each child's role in his/her learning and how do you get these expectations across to the children?
4. What types of assessment do you use to determine your students' understanding and progress?

What to Turn In:

- After your interview, you will write a 2 -3 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.
- **Make connections to our class readings and discussions.**

Grading

This assignment is worth 20 points. Your work will be evaluated on the completeness and thoughtfulness of your comments.

- **Classroom Observation Reflection (30 points)** Due: Fri., Feb.14
- 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.

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

1. Organization

- 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

- What communications did you observe among students?
- What kinds of communication occurred between the teacher and the entire class?
- What kinds of communication occurred between the teacher and individual students?
- What communication occurred when there were mistakes?
- Which occurred most frequently: teacher-talk or child-talk?

What to Turn In:

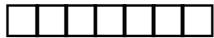
- After your observation, you will write a 2 - 3 page paper reflecting on what you learned about classroom organization and communication. You should identify specific examples that led you to these conclusions. Try to address all of the bulleted questions below each area heading as these questions are 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
- **Make connections to our class readings and discussions.**

- **Student Interview Reflection** (80 points- 20 points for each of the 4 interviews) **Due: #1 Tuesday, Feb. 11 : #2 Tuesday, Feb. 18 : #3 Tuesday, Feb. 25: #4 Tuesday, March 4**
- , 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 four 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.

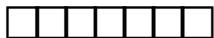
The interview questions will be presented and discussed in class.

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 each day of interviewing, you will write a reflection about mathematics interview you conducted. In a 1 – 2 page paper, you will describe:

- what you learned about each child's thinking, i.e. strategies for solving the problem
- what you saw in regards to each child's confidence and attitude about doing mathematics
- what you would plan to teach each child to continue his/her learning on the topic

Be sure to make connections to our class discussions and readings

Grading

This assignment is worth 80 (20 x 4) points. Your work will be evaluated on the completeness and thoughtfulness of your comments.

How are the interview reflections to be completed?

For each of four interviews, write a meaningful reflection (no more than 2 pages) on 1) the interview process and the results of your interview, as well

as 2) specific, prescriptive recommendations that you would give in light of your interviewee's current level of mathematical understanding. Develop that reflection with an eye to helping your interviewee in terms of making effective instructional decisions.

Although the reflection should not exceed two pages, it **must** answer the following two questions:

- 1. What specifically did you learn about this child's mathematical understanding? You should provide ample evidence of knowledge gained from this experience. Be very specific about what it is that your interviewee understands or does not understand and how he/she demonstrated this understanding/lack of understanding.**

- 2. What specifically would you do for this child if you were his/her teacher?** This part of the reflection is clearly related to what was learned about the child by way of the interview. Be very specific and clear about what you would recommend as a follow-up.
 - As you format your reflection, please bullet the two questions above you are responding to very clearly.

The rubric for this assignment is at:

http://rubistar.4teachers.org/view_rubric.php3?id=115675

- **Planning and Teaching a Lesson /Reflection (40 points – 20 for the lesson and 20 for the reflection)**

Due:

Lesson	Reflection
Tuesday, Feb. 11 – group A	Tuesday, Feb. 18
Friday, Feb. 14 – group B	Friday, Feb. 21
Tuesday, Feb. 18 – group C	Tuesday, Feb. 25
Friday, Feb. 21 – group D	Friday, Feb. 28
Tuesday, Feb. 25 – group E	Tuesday, March 4
Friday, Feb. 28 – group F	Tuesday, March 11
Tuesday, March 4 – group G	Tuesday, March 11

Working in small groups, your team will first compile resources on

a predetermined mathematical topic and then design a lesson that you will present to our class as if we were your students. 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.

You will then reflect and write about your lesson. Ask yourself what did the students learn. How do you know what they learned? Did you have to make changes or adjustments? What were they? What did you learn from teaching this lesson? Write a 2 – 3 page paper that analyzes your lesson.

The rubric for this assignment is at:

http://rubistar.4teachers.org/view_rubric.php3?id=115690

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 Connection (20 points)** **Due: Sign up for date**

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. Bring 30 copies of your paper to class.

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 Textbook (50 points) Due: Tuesday, March 11
(Note you need standards and textbook on Tuesday, Feb. 16
and analysis of Number & Operations strand on Friday, Feb. 21.
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Students will review the mathematics curriculum currently being used in your 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).

Purpose

The purpose of this assignment is to simulate the experience you will have as a first year teacher in analyzing the materials provided to you by the school district. After completion of this activity, you should be able to articulate the strengths and weaknesses of the programs shared within your grade level group in terms of: (1) the extent to which they address the California Content Standards for Mathematics; and (2) How well they develop student mathematical thinking. Additionally, you should be able to make a plan for what you are going to do to remedy the weaknesses in the

program.

Steps to Completion

1. Make arrangements with your master teacher or school library media specialist to obtain a copy of the Teacher's Manual to the program currently being used by the school district for your grade level. If you are currently under Emergency Contract, use your own teaching manual. If you do not have access to a classroom, first be creative about obtaining a teacher's manual. If all else fails, ask me for assistance.

2. Either download or obtain a copy of the California Content Standards in Mathematics for your grade level only. You may download the standards either from <http://www.cde.ca.gov> or <http://score.kings.k12.ca.us>. As of fall, 2000, the SCORE site has a feature called, "Standards Matrix – Easy Access to Standards. Through this feature, you can easily print a PDF of your grade level standards.

3. Create a table in your word processor such as the one below on which you:
 - a. List the standards for your grade level,
 - b. Note in the program where the given standard is covered – including personal notes about the extent to which the standard has been addressed and supports the development of student thinking, and
 - c. Rate the program's coverage of the standard by the scale listed below the example.

EXAMPLE

PROGRAM TITLE: *Scott Foresman*
Grade: 2

STANDARD	PROGRAM LOCATION	RATING
1.0 Students understand the relationship between numbers, quantities, and place value in whole numbers up to 1000		
1.1 Count, read, write each place value		

1.2 Order and compare using <, =, >		
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Rate the program's coverage on the following scale:

- 0 = Standard not addressed
- 1 = Standard is poorly developed and addressed
- 2 = Meets standard with moderate coverage but needs more
- 3 = Meets standard with appropriate coverage
- * = Exceeds grade level standards

4. Conclude your tabled list with an analysis of the weaknesses of the program that you consider will require you to search for additional resources or adjust instruction to meet your students' needs. Be sure to think about what you have learned about creating high quality mathematics learning experiences that develop students' mathematical understanding. Consider yourself the instructional decision-maker for your students!
5. Following your analysis include a reflection on this individual portion of the assignment. What was valuable? What are your commendations, comments, and concerns?
6. Schedule a meeting with the others in your grade level group. Share your results and compare programs. At the conclusion of your discussion, complete a quick-write on your discussion. What did you learn? How fruitful was the discussion? Attach the quick-write to your analysis.

Suggestions

1. It is tempting to sit with others who have the same program to analyze as you. It is natural to want to "divide and conquer" the task. However, you are the teacher who must know about the program you are required to teach. Don't cheat yourself. Go through the exercise on your own first.
2. When you set your meeting time, agree that everyone will come to the meeting prepared with the analysis in at least draft form for the essential discussion to be completed for the benefit of all.
3. Structure the time you are going to allocate to the discussion. It may be a waste of your time to randomly share. Try starting as a round robin

progressing standard by standard. Structure your time to help everyone understand the organization and expectations of each program. The program being shared by your colleague may be the one you are teaching next year. Listen carefully!

Assessment

This experience accounts for of your grade in this course. Take the time to do a careful job. You will be assessed using the 4-point rubric on the extent to which your work addresses each of the following areas:

1. Quality of document submitted. – Including asking, “Did you follow the directions for the elements of the assignment?”
2. Quality and completeness of the analysis of the mathematics program in comparison to the standards.
3. Quality and completeness of the discussion of the weaknesses of the program
4. Depth of reflections – both the individual reflection and the group process experience quick-write.

Checklist for Document

Standards analysis table

Analysis of program weaknesses

Reflection on individual experience

Quick-Write reflection on group experience

The rubric for this assignment is at:

http://rubistar.4teachers.org/view_rubric.php3?id=317969

Grading

Reading reflections – 40 points (10x 4)

Web sites – 20 points

Literature connections – 20 points

Teacher interview – 20 points

Student interviews – 80 points (20 x 4)

Math lesson/ reflection – 40 points

Classroom observation – 30 points

Curriculum analysis – 50 points

270 – 300 = A

240 – 269 = B

210 – 239 = C

180 – 209 = D

less than 180 = F

You must maintain a B average in your teacher education courses to receive a teaching credential from the state of California.

Writing Requirement:

CSUSM has adopted an all-university writing requirement. 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 transform public education by preparing thoughtful educators and advancing professional practice. We are committed to the democratic principles of educational equity and social justice for all learners, exemplified through reflective teaching, learning, and service. We value 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.**

COURSE PLAN for Spring, 2003

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

1: Tuesday, January 21

**Introduction: Developing
Understanding, Competence,
and Confidence**

Due: Survey

2: Friday, January 24

The Role of the Teacher

Reading: About Teaching Mathematics, pp. 139-160
Math Time, Part 1, pp. 3-37
Elementary & Middle School Mathematics, pp. 3 - 25

Due: Reading Reflection

**Sign up for literature
connection and for lesson
design/presentation**

3: Tuesday, January 28

Children's Mathematical Thinking

Reading: About Teaching Mathematics, pp.3-28
Math Time, Part 2, pp. 39-52
Elementary & Middle School Mathematics, pp. 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

Mathematics Web Sites

Literature connection

4: Friday, January 31

Nature of Learning Tasks

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

Elementary & Middle School Mathematics, pp. 40 - 61

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

and

Mooney, Edward and Labinski, Cheryl.(2001) Inside the Minds of 6 Year Olds. ENC Focus. 30 – 33.

Due: Reading Reflection

**Literature connection
Math standards for your
grade level/ Text adopted by
your district**

5: Tuesday, February 4

The Culture of the Classroom

Reading: Elementary & Middle School Mathematics
pp. 450 – 464

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

Due: Reading Reflection

Literature connection

6: Friday, February 7

Communication in a Mathematics Classroom

Reading: Elementary & Middle School Mathematics, p. 437 – 449
Successful Inclusive Teaching, chp. 10 & 11
Math Time, Part 3, pp. 53-72

Articles: Behrend, Jean. (September. 2001) Are Rules Interfering with Children's Mathematical Understanding? Teaching Children Mathematics. 36 – 40.

and

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

**Teacher Interview
Literature connection**

7: Tuesday, February 11

Assessment in Mathematics

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

Due: Reading Reflection

**First student interview
Design and present a math lesson
- group A
Literature connection**

8: Friday, February 14

Mathematics: Number and Place Value

Reading: About Teaching Mathematics, pp. 173-222
Elementary & Middle School Mathematics, p. 87 – 106,
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

**Design and present a math
lesson - group B
Literature connection**

Classroom Observation

9: Tuesday, February 18

Mathematics: Fractions, Decimals, and Percents

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

Due: Reading Reflection

Second student interview
Design and present a math lesson - group C
Literature connection

10: Friday, February 21

Mathematics: Measurement

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

Due: Reading Reflection

Design and present a math lesson - group D
Literature connection
Analysis of Standards/ Text for Numbers & Operations strand in your grade level

11: Tuesday, February 25

Mathematics: Probability and Statistics

Reading: About Teaching Mathematics, pp. 59-78, 261-271
Elementary & Middle School Mathematics, p. 352 - 383
Article: Usnick, Virginia, McCarthy, Jane, and Alexander, Shirley. (December, 2001). Mrs. Whatsit “Socks” It to Probability. Teaching Children Mathematics. 246 – 249.

Due: Reading Reflection

3rd Student interview

**Design and present a math
lesson - group E
Literature connection**

12: Friday, February 28

Mathematics: Geometry and Art

Reading: About Teaching Mathematics, pp. 79-99, 272-283
Elementary & Middle School Mathematics, pp.
306 - 351

Article: Moyer, Patricia. (November, 2001) Patterns
and Symmetry: Reflection of Culture. Teaching
Children Mathematics, 140 – 144.

Due: Reading reflection

**Design and present a math
lesson - group F
Literature connection**

**Due: Preliminary analysis of
your text book curriculum for
your grade level**

Bring your table of analysis comparing the standards and the program you are using in your classroom to class. We will work in grade – level groups to share results and compare programs.

13: Tuesday, March 4

**Mathematics: Algebra, Patterns, and
Functions**

Reading: About Teaching Mathematics, pp. 112-124, 292
Elementary & Middle School Mathematics, pp.384 - 402
Article: Ferrini-Mundy, J., Lappan, G., Phillips, E.
(February, 1997). Experiences with patterning.
Teaching Children Mathematics. 282-288.

Due: Reading Reflection

**4th Student interview
Design and present a math
lesson - group G**

Literature connection

14: Friday, March 7

**Reflective Teaching Conference
California Center for the Arts
Escondido**

15: Tuesday, March 11

Logic and Discrete Mathematics

Reading: About Teaching Mathematics, pp. 100-111, 285-291
Math Time, pp. 113, 117-125

Due: Reading Reflection

**Curriculum
analysis/reflection**

16: Friday, March 14

Mathematics: Tools and Technology

Reading: Elementary & Middle School Mathematics, pp. 465 - 478

Articles: Reys, Barbara and Arbaugh, Fran. (Oct. 2001). Clearing Up the Confusion Over Calculator Use in Grades K – 5. Teaching Children Mathematics. 90 – 94.

and

Drier, H.S. (February, 2000). Investigating mathematics as a community of learners. Teaching Children Mathematics. 358-363.

Due: Reading Reflection