

**California State University San Marcos
College of Education**

**EDMS 545 - Elementary Science Education
Spring 2007**

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Required Textbooks:

Teaching Children Science. An Inquiry Approach
By Alfred E. Friedl. NY: McGraw-Hill.

California Science Framework

COURSE DESCRIPTION

This course is designed to provide a comprehensive overview of the objectives, skills, concepts, experiments, materials, and methods necessary to teach science to elementary school children. A series of group activities will provide you with first-hand experiences in these areas. This course focuses on instructional methods, techniques, materials, lesson planning, curriculum development, organization and assessment in science. The integration of curricular areas is addressed. Methods of cross-cultural language and academic development will be integrated in to the course.

COURSE OBJECTIVES

By the end of this course, students should be able to

1. Demonstrate proficiency with inquiry skills of observing, measuring, inferring, classifying, predicting, verifying predictions, hypothesizing, isolating variables, interpreting data, and experimenting.
2. Identify exemplary materials (curriculum kits, science programs, textbooks, equipment, technology, ancillary materials) appropriate for elementary school children.
3. Demonstrate knowledge and understanding of the California Science Framework, the California Science Content Standards, and the National Science Education Standards.
4. Demonstrate an understanding of the physical, earth and life science concepts included in the K-8 California Science Content Standards, and how to design lessons to teach the concepts.
5. Use the Learning Cycle model of instruction to teach science in a contemporary manner.
6. Use technology in elementary science teaching.
7. Demonstrate confidence in leading and performing investigations designed to teach science concepts, science process skills, and scientific attitudes. .
8. Use authentic methods of assessment to evaluate student learning of science concepts and processes.
9. Design a 3-lesson elementary science teaching unit .
10. Practice strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs).

COE 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)

INFUSED COMPETENCIES

CLAD

In 1992, the College of Education voted to infuse Cross-cultural, Language and Academic Development (CLAD) competencies across the curriculum. The CLAD competencies are attached to the syllabus and the competencies covered in this course are highlighted.

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 REQUIREMENTS

COE Attendance Policy: "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."

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. Absences and late arrivals/early departures will affect the final grade. If you miss more than 20% of the class, you may not receive a passing grade for the course. Absences do not change assignment due dates. Late assignments will receive a 10% reduction in points for each day late. After one week, late assignments will receive no credit.

ATTENDANCE AND PARTICIPATION

This course deals with complex material processed in a variety of ways. Structured interactions, group processes, oral presentations, guided discussion of readings, and self-disclosure exercises are the norm. Students are expected to have read assigned materials by the date indicated in the syllabus, and should be prepared to discuss readings individually or in variously structured groups. The degree of your engagement in these processes forms the basis for points assigned. Due to the fast paced and highly interactive nature of the course, regular attendance and full participation are expected: teaching and learning is difficult (if not impossible) if one is not present for and engaged in the process. Therefore, the above College Attendance Policy is amplified as follows: 1. Missing more than 1 class meeting will result in the reduction of one letter grade. 2. Arriving late or leaving early on more than 2 occasions will result in the reduction of one letter grade. 3. Illness and emergency circumstances will be considered/negotiated on a case-by-case basis. These measures should not be considered punitive, as students are expected to establish appropriate personal, academic and career-ladder priorities. Therefore these measures should be

viewed as taking appropriate individual responsibility for one's own learning in a democratic, collaborative and reciprocal-learning environment.

TOPICS OUTLINE

The Learning Cycle Model of Teaching
Learning Cycle Science Lesson demonstrations
Writing Objectives and Explanations of Science Concepts
CA Science Content Standards Grades K-8
California Science Framework
SDAIE Strategies in Science
Infusing Writing Activities in Science Lessons
Science Curriculum Kits and State Approved Texts
Science Process Skills and Scientific Attitudes
Current Issues in Science Education
Infusing Technology into Science Teaching
Authentic Assessments in Science
Science Projects, Student Research, Science Fairs
Safety in the Science Class
Inclusion and Teaching Science to Students with Special Needs

COURSE ASSIGNMENTS

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|---|-------|
| 1.Resource Notebook or Electronic Resource File | (10%) |
| 2. Peer Teaching of Hands-On Science | (15%) |
| 3. Standards & Framework Task and Presentation | (5%) |
| 4. Discussion Topics/Questions (postings on WebCT6) | (15%) |
| 5. Exploratorium Event | (15%) |
| 6. 3-5 Day Unit Plan | (15%) |
| 7. TPE Reflection and Response on Task Stream | (15%) |
| 8. Participation, Collaboration, & Professionalism | (10%) |

ASSIGNMENT DESCRIPTIONS

1. RESOURCE NOTEBOOK (ONE ENTRY PER CHAPTER

*Students will complete *responses to each chapter* in one of the following forms:

- A. A Big Ideas paper explaining the key science concepts and example activities
- B. A visual or symbolic representation of the key science concepts
- C. A graphic organizer that demonstrates the key science concepts and their relationships to one another (samples will be provided in class)

The purpose of this assignment is to provide each student with a collection of all the resources developed and shared in this course. Each student will keep a notebook or electronic file of class activities, and submit the organized, completed collection.

*The notebook may be organized by topic or grade level (or any structure which makes use of the notebook most likely for the individual teacher candidate) and must include resources such as California Science Content Standards, Learning Cycle Lessons presented in class, field trips, professional development sources, and web sites.

2. PEER TEACHING OF HANDS-ON SCIENCE LESSONS

Students will lead hands-on science lessons during class. The lessons should model inquiry instruction, good questioning skills, and be content-understandable and non-judgmental. The lessons should be based on the California content standards. SDAIE strategies, technology integration, and methods for teaching students with disabilities should all be included and pointed out during the lesson.

You will work in groups of 3-4 people to lead science lessons based on the Learning Cycle Model of Instruction. You will teach these to your classmates. Each lesson will be allocated 25-30 minutes of class time to teach. Your classmates will not role-play elementary students, but will learn the science content and how to teach it. Treat your classmates as teachers, not elementary students.

The lessons should include hands-on lessons, and should emphasize particular science concepts. The Exploration and Application phases of the Learning Cycle must require different hands-on science activities using manipulatives. Hands-on activities are NOT reading or completing worksheets (though they may require students to read something or complete lab observation sheets). You should take the activities "off of paper" and require students to use the science process skills with science manipulatives.

Be sure you understand the concepts you are emphasizing, and that you can explain them. The lessons should be developmentally appropriate for K-6, and should follow the NSTA Safety Guidelines.

Make sure that you include the 3 stages of the Learning Cycle.

Make sure that science content background and applications to everyday life are addressed. You need to explain SDAIE strategies and adaptations for students with disabilities.

Prepare a Powerpoint Computer Presentation to use in your lesson. The presentation should include a detailed explanation of the science content, as well as a list and definitions of science concepts important to the lesson. Additionally, include a list of at least 10 web sites (with short descriptions) that address the science topic and concepts through simulations, graphics and movies. You should have links to these web sites and show examples during the lesson. **You need to email the presentation to the instructor 2 days prior to your presentation.

Each group will post a lesson plan for the peer teaching activity which includes the 3 stages of the learning cycle, SDAIE strategies, adaptations for students with disabilities, a 1-2 page summary of the science content background, a list of science concepts taught (with definitions), a list of 10 relevant web sites (with descriptions), and applications to everyday life. List group members' names at the top. *On the first line, write out the science concept(s) you are teaching in a complete sentence. Do not say "The students will ____." (That is an objective, not a science concept.)*

Each group will prepare an evaluation instrument to be used by (a) the instructor, (b) 5 class members not in the group, (c) group members (each will complete one copy). The evaluation instruments should have the group members' names, title and science topic at the top. The instructor's copy should include a description of each person's role in researching and presenting.

Lesson Plan Format

Lesson Title: What is the title of your lesson?

Grade Level: What is the grade level?

California Science Content Standard(s): What standards are addressed? Include at least one science area (life science, physical science, or earth science) standard and one investigation standard.

Lesson Objective(s): What do you want students to be able to do? Write in complete sentences. Use an action verb and explain how students will demonstrate their new knowledge and understanding. "The students will _____."

Science Concept(s): What are you trying to teach?
Do not say "The students will ____." (That is an objective, not a science concept.)

Student Groupings: How will you group students for instruction?

Materials/Resources/Technology: What does the teacher need? What do the students need?

Assessment: How will your students demonstrate that they have met the objective? Is there a clear match between the standards, objectives and the assessment?

Lesson Procedures: Explain the procedures for each. Include what the teacher will do and what the students will do.

- 1 Exploration (Students should first make predictions.)
(minutes?)
- 2 Concept Invention
(minutes?)
- 3 Concept Application
(minutes?)

Accommodations/Adaptations/Applications:

- 1 SDAIE strategies and explanations (5)
- 2 Adaptations for students with disabilities and explanations (5)
- 3 Applications to everyday life and explanations (5)

Science Content Background: 1-2 page summary of the science content background

Web Sites: 5 interactive relevant web sites with descriptions

Children's Literature Books: Title, author, publisher, year of 3 children's books on the topic

References: Title, author, publisher, year of resources

3. STANDARDS & FRAMEWORK ASSIGNMENT

This will be completed the first evening in class.

4. DISCUSSION TOPICS/QUESTIONS

Discussion topics will be posted each week on WebCT6. You will be required to respond to at least 2 of these per week by posting responses. Your response may include comments on classmates responses. Due dates and times will be posted with the topic/question.

5. SCIENCE EXPLORATORIUM EVENT

Develop an inquiry activity to teach to elementary students.

You will prepare a hands-on science lesson and poster about a science concept. You will present the lesson at our Exploratorium Event. Be sure you understand the concept(s) you are emphasizing, and that you can explain it. The activity should be developmentally appropriate, and should follow the NSTA Safety Guidelines. Prior to teaching the lesson, turn it in to your instructor for review. After teaching the lesson, turn in a copy of your Lesson and your Reflection. The lessons should include hands-on lessons, and should emphasize particular science concepts. The Exploration and Application phases of the Learning Cycle must require different hands-on science activities using manipulatives. Hands-on activities are NOT reading or completing worksheets (though they may require students to read something or complete lab observation sheets). You should take the activities “off of paper” and require students to use the science process skills with science manipulatives.)

Turn in the following:

1. Type the lesson.
2. Include your name at the top of the page and references at the bottom of the page.
3. Science Concept you are teaching. Write it out in a complete sentence. Do not say “The students will ____.” (That is an objective, not a science concept.)
4. California Science Content Standards and Investigation Standards addressed
5. 1-3 Learning Objectives
6. Exploration Activity
7. Concept Invention
8. Concept Application Activity
9. The Reflection (answer the following):
 - How did the children respond? (What did they say and do?)
 - How do the children’s actions and responses demonstrate their level of understanding.
 - How did you (or can you) improve upon your lesson to facilitate understanding?

6. 3-DAY SCIENCE TEACHING UNIT – (in groups of 3-4)

You will create a typed unit on a specific science topic and post it on WebCT6.

1. Unit Plan (1 page-include title, grade level, goals for unit, Calif. Science Content Standards addresses, and one-two line descriptions of each learning cycle lesson)
2. 3 Learning Cycle Lesson Plans (including the one presented in class) *May be adapted from commercial lessons*

For each lesson, include the following: *Do not re-invent activities.*

 - a. Topic
 - b. Science Concept you are teaching. Write out the science concept(s) you are teaching in a complete sentence. Do not say “The students will ____.” (That is an objective, not a science concept.)
 - c. California Science Content Standards and Investigation Standards addressed
 - c. Objectives (1-2) (use behavioral objectives with action verbs—i.e., The students will ____)
 - d. Exploration Activity- explain what students will do and what teacher will do
 - e. Concept Invention--explain what students will do and what teacher will do
 - f. Concept Application Activity- explain what students will do and what teacher will do
 - g. Authentic Assessment
 - h. Rubric for Assessment
 - i. SDAIE Strategies and explanation of how used
 - j. Adaptations for Students With Disabilities and explanation of how used
 - k. 3 Ways to Integrate Technology and Explanation of how used
3. Science Content Background (3-5 pages—typed pages)
4. List and short descriptions of 10 Web Sites (with short descriptions) that address the

- science topic and concepts through simulations, graphics and movies.
5. References

The lessons should include hands-on lessons, and should emphasize particular science concepts. The Exploration and Application phases of the Learning Cycle must require different hands-on science activities using manipulatives. Hands-on activities are NOT reading or completing worksheets (though they may require students to read something or complete lab observation sheets). You should take the activities “off of paper” and require students to use the science process skills with science manipulatives.

7. TPE- REFLECTION & RESPONSE ON TASK STREAM

For each of TPE 1A (Making Subject Matter Comprehensible to Students) and TPE 5 (Engaging and Supporting Students in Learning) you will post on Task Stream a one-page (maximum) reflection on how the course activities enabled you to meet the particular TPE. You are required to attach artifacts from the class to demonstrate/substantiate the abilities described in your reflection.

CRITERIA FOR GRADING ASSIGNMENT

| | | |
|---|---|---------|
| A | Outstanding work on assignment, excellent syntheses of information and experiences, great insight and application, and excellent writing. | 90-100% |
| B | Completion of assignment in good form with good syntheses and application of information and experiences; writing is good. | 80-89% |
| C | Completion of assignment, adequate effort, adequate synthesis of information and application of information and experiences, writing is adequate. | 70-79% |
| D | Incomplete assignment, inadequate effort and synthesis of information, writing is less than adequate. | 60-69% |

Late assignments will be penalized by a 20-percent reduction each day they are late.

COURSE GRADES

Course Grades will be determined by points earned:

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

Assignment Schedule will be distributed at the first class meeting.