

EDMI 545
Science Education in the Middle School
California State University San Marcos

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Required Textbooks:

Science Matters: Achieving Science Literacy:
Robert M. Hazen & James Trefil

Great Explorations in Math & Science (G.E.M.S.) Books

Any two selection that matches a CA Science Standard <http://www.lhs.berkeley.edu/GEMS/>

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 middle school students. 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. It is my sincere wish that the activities presented will motivate you to teach science to adolescents in a confident, competent manner.

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 middle school students.
3. Demonstrate an understanding of the California Science Standards and how to design lessons around them.
4. Use the Learning Cycle model of instruction to teach science in a contemporary manner.
5. Use of technology in middle school science.
6. Demonstrate confidence in leading and performing investigations designed to teach science concepts, science process skills, and scientific attitudes. .
7. Use authentic assessment to evaluate student learning of science concepts and processes.
8. Practice strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs.
9. Demonstrate knowledge and understanding of the California Science Framework and California Science Content Standards.

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.

Statement of CLAD Infusion

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.

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 3 class sessions or are late (or leave early) for more than four sessions, your highest possible grade is a B. If you miss 5 class sessions, your highest possible grade is a C. If you miss more than 20% of the class (6 class sessions), 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.

Course Outline

Class #	Date	Topic	Assignment Due
1	9/14	Teaching Science in the Middle. The Learning Cycle Model of Teaching Science Teaching Science in Inclusive Classrooms Using Science Kits & Textbooks Exemplary Science Materials	
2	9/26	CA Science Content Standards Grades K-8 Writing Objectives Using CA Science Standards Authentic Assessment	
3	10/17	Web Activity, Meet in Computer Lab Using Internet Resources in Presentations Science Resources via the Internet	Web Activity due 2/20

4	10/29 CA Science Content Standards Grades K-8 State Approved Textbooks, CA State Frameworks	Download State Frameworks print assigned section
5	2/4 Review syllabus The Learning Cycle Model of Teaching Science How to present Hands-on Science Lessons	
6 & 7	2/8 Meet at San Diego Wild Animal Park Workshop: Teacher resources available from The San Diego Wild Animal Park CA Science Standard Evolution	Reading Response Ch 17
8 & 9	2/13 Authentic Assessment and Rubrics Hands-on Science Lessons Groups 1 & 2 present AM Groups 3& 4 present PM	Reading Response Ch 13 &14
10 & 11	2/20 Writing to Learn Activities Evaluation of Presentations Hands-on Science Lessons Groups 5 & 6 present AM Groups 7 & 8 present PM	Web Assignment Due Reading Response Ch 4 & 6
12	2/25 Science Projects, Student Research, Science Fairs and Science Safety Hands-on Science Lessons Groups 1 & 2 present AM	Reading Response Ch 10
13	2/27 Earthkam, Newspapers in Education Hands-on Science Lessons Groups 3 & 4 present PM	Reading Response Ch 16
14	3/4 Science Fair, Investigation & Experimentation Hands-on Science Lessons Groups 5& 6 present AM	Reading Response Ch 17, Newspaper Activity Due
15	3/6 Reading via Science Resources Hands-on Science Lessons Groups 7 & 8 present AM	Science Unit Plan

COURSE ASSIGNMENTS

1. Reading Responses (due for each chapter assigned)	20%
2. Web Sites Assignment	10%
3. Leadership of Hands-on Science Lessons	30%
4. Science Unit	30%
5. Newspapers in Science Education	5%
6. Science Lessons from Fall Unit Plan	5%

ASSIGNMENT DESCRIPTIONS

1. READING RESPONSES (ONE PER CHAPTER)

Students will be assigned readings and should present their responses to each chapter assigned in one of the following forms:

- a. A Big Ideas paper explaining the key science concepts
- 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.

The responses should be 1-2 pages. They may be typed or handwritten, but must be legible. They will be checked off for completion each due date, noted in the course outline. Representative samples will be examined for closer reading.

2. WEB SITES ASSIGNMENT

For this assignment, we will visit the World Wide Web using Netscape or Explorer. Begin by selecting a grade level and a California Science Standard or sub standard. Each student finds five web sites containing science resources and type short summaries of what the web sites has to offer to support your teaching of the science standard. Include description of images, movies, simulations, resources, lessons etc. Additionally, each student will print five science lessons from the Web that could be used in creating a unit for teaching the science standard selected. You may work in-groups, but each student must turn in different science lessons and summaries of different web sites.

3. LEADERSHIP OF HANDS-ON SCIENCE LESSONS (TWO GROUP LESSONS)

You will work in-groups to lead science lessons based on the GEMS books you have selected. Select one activity for each day you are presenting. Each lesson will be allocated a maximum of forty-five minutes of class time to teach including set up and clean up. The class will not role-play middle school students, but will learn the science content and how to teach the GEMS book. Treat your classmates as teachers, not middle level students.

Begin the lesson by giving an introduction to the scientific concepts covered in the GEMS book. What scientific background knowledge would the teacher need to know to present the GEMS book?

List sixth through eight grade Science Standards you could teach with the GEMS book. Describe the grade level and Science Standard you are addressing, and the specific substandard will you be teaching. The following web site will help you make the Correlation. <http://www.lhs.berkeley.edu/GEMS/correlation.html>

Present one or more of the activities, have enough materials for the class to participate in-groups. Modify the time spent working on the activity, so you can take the class through the teacher discussion, help your classmates understand the Science Standard and the science concept being taught. Discuss the applications of this science concept to everyday life. Science Standards can be downloaded at <http://www.cde.ca.gov/standards/>

Discuss the Time Frame and materials needed to complete the GEMS book. What safety considerations would you have to consider teaching the unit? Are there special materials that may be hard to obtain?

Describe for the class resources from the Internet you have found that would support the teaching of the GEMS book and/or Science Standard. Images, movies, simulations, sounds, and other exciting resource are available free over the Internet. Include the URLs in your handout to the class. Even though these resources can not be shown in class, they will serve as a future reference.

Each group will prepare a handout that includes; name of the GEMS book, time line, and a summary of the science content taught in the activity. List of sixth through eight grade CA Science Standards that could be covered using the GEMS book, safety considerations, any special materials or equipment required and applications of concepts to everyday life. Include a description of three Authentic Assessments that would allow you to determine if students mastered the standard. List the URL's of web sites that would support the GEMS book and/or Science Standard. Make a copy for each class member, give one copy to the **instructor's with a description of each person's role in researching and presenting the activity.**

Science Unit

Select one of your GEMS books and develop a five-day science unit. Do not use the GEMS book for more than three of the five days. Show how you would integrate the GEMS book into a longer unit teaching a specific Science Standard. Use the Middle Level Lesson Plan format and write up one lesson using one GEMS activity. The lesson plan should have enough detail that anyone could follow it and present the lesson with the GEMS book in hand. For the other days describe activities to support the teaching of a CA Science Standard or substandard. You may use textbooks available from WPMS, other lessons from your GEMS book or lessons from the Internet. The unit will clearly identify the grade level and science standard or substandard the lesson is addressing. Develop two authentic assessments with scoring rubrics for the unit that would determine if a student mastered the Standard. The unit needs to include one guided reading activity, one writing activity, and a list of three writing prompts that would help students learn the scientific concept. Remember except for the one lesson, you don't have to develop lesson plans around the other activities.

Science Current Events

Each student will develop a guided reading assignment for a science article from the San Diego Union Quest section Wednesday 2/27. A sample format will be given in class.

Science Lessons from Fall Unit Plan

Each student wrote one science lesson as part of the unit plan. This grade has already been recorded.

Rubric for Science Unit

Score	Quality of Work			
_____	Less than five-day lesson plan that does not integrate GEMS unit into a longer unit covering a Science Standard, it has learning activity described. 10 pts.	Less than five-day lesson plan that some what integrates GEMS unit into a longer unit covering a Science Standard, it has few different learning activities described. 14 pts.	Five-day lesson plan that integrates GEMS unit into a longer unit covering a Science Standard, it has a few different learning activities described. 16 pts.	Five-day lesson plan that integrates GEMS unit into a longer unit covering a Science Standard, it has a wide variety of learning activities described. 20pts.
_____	Lesson plan using does not follow ML lesson plan format of one GEMS activity, few details 10 pts.	Lesson plan using ML lesson plan format of one GEMS activity, few details 14 pts.	Detailed lesson plan using ML lesson plan format of one GEMS activity, very detailed. 16 pts.	Exceptionally detailed lesson plan using ML lesson plan format of one GEMS activity, very detailed. 20pts.
_____	The unit does not identify the grade level and science standard or substandard the lesson is addressing. 5 pts.	The unit does not clearly identify the grade level and science standard or substandard the lesson is addressing. 7 pts.	The unit identifies the grade level and science standard or substandard the lesson is addressing. 8 pts.	The unit clearly identifies the grade level and science standard or substandard the lesson is addressing. 10pts.
_____	One or no authentic assessment with scoring rubric for the unit that does not clearly measure student mastery of Science Standard or substandard. 10 pts. or less	One authentic assessment with scoring rubric for the unit that does not clearly measure student mastery of Science Standard or substandard. 14 pts.	Two authentic assessments with scoring rubrics for the unit that does not clearly measure student mastery of Science Standard or substandard. 16 pts.	Two authentic assessments with scoring rubrics for the unit that measure student mastery of Science Standard or substandard. 20pts.
_____	No article or guided reading activity 0 pts.	No article but a guided reading activity that does not connect clearly to the unit. 7 pts.	One article and a guided reading activity that does not connect clearly to the unit. 8 pts.	One article and a guided reading activity that connects to the unit. 10pts.
_____	No writing activity. 0 pts.	One writing activity that does not extend student learning of science concepts. 7 pts.	One writing activity that does not clearly extend student learning of science concepts. 8 pts.	One writing activity that extends student understanding of science concepts. 10pts.
_____	No writing prompt. 0 pts.	One writing prompt that supports student understanding of science concepts. 7 pts.	Two writing prompts that supports student understanding of science concepts. 8 pts.	Three writing prompts that supports student understanding of science concepts. 10pts.