

EDMS 545: Science Education in the Elementary School

California State University San Marcos

SPRING 2001

Class Meetings: Thursday, 6:00 –8:45 PM Day Middle School

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The Mission Statement of the College of Education, CSU San Marcos

The mission of the College of Education Community is to transform public education by preparing thoughtful educators and advancing professional practices. We are committed to the democratic principles of educational equality and social justice for all learners, exemplified through reflective teaching, learning, and service. We value diversity, collaboration, professionalism, and shared governance.

CLAD Infusion

In 1992, the College of Education voted to infuse Crosscultural, 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.

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

EDMS 545 Science Education Course Handouts. Kathy Norman

Recommended Books: Science Framework for California Public Schools. (1990). Developed by the Science Curriculum Framework and Criteria Committee. Sacramento. CA Dept. of Education.

Other Good Books: A Year of Hands-on Science. (1996). By Lynne Kepler. New York: Scholastic.

200 Goopy, Slippery, Slimy, Weird & Fun Experiments. (1993). By Janice VanCleave. New York: JohnWiley

These are in the bookstore, but there are many excellent hands-on science books. Check bookstores, museums, teacher stores, even grocery stores!

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. This class requires participation/observation in the public schools. It is my sincere wish that the activities presented will motivate you to teach science to children in a confident, competent manner.

COURSE OBJECTIVES

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

- Demonstrate proficiency with inquiry skills of observing, measuring, inferring, classifying, predicting, verifying predictions, hypothesizing, isolating variables, interpreting data, and experimenting.
- Identify exemplary materials (curriculum kits, science programs, textbooks, equipment, technology, ancillary materials) appropriate for elementary school children.
- Demonstrate an understanding of basic science themes (energy, evolution, patterns of change, scale and structure, stability, and systems and interactions) and basic science concepts in the fields of physical science, earth science and life science.
- Use the Learning Cycle model of instruction to teach science in a contemporary manner.
- Use telecommunications and other forms of technology in elementary science teaching.
- Demonstrate confidence in leading and performing investigations designed to teach science concepts, science process skills, and scientific attitudes.
- Use alternative methods of assessment to evaluate student learning of science concepts and processes.
- Design a 3-lesson elementary science teaching unit .
- Strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs.
- Demonstrate knowledge and understanding of the National Science Education Standards and California Science Content Standards.

COURSE REQUIREMENTS

College of Education Attendance Policy: 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 two class sessions or are late (or leave early) for more than three sessions, you cannot receive a grade of A or A-. If you miss 3 class sessions, your highest possible grade is a C+.** COE attendance policy states, "At a minimum, students must attend 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 students have extenuating circumstances, please contact the instructor as soon as possible. **Absences do change assignment due dates.**

Professionalism: It is expected that students will come to class prepared to discuss the readings, submit required assignments, and participate in class activities. Teacher education is a professional preparation program. Students will be expected to adhere to academic honesty and integrity, standards of dependability, confidentiality and writing achievement. Because it is important for teachers to be able to effectively communicate their ideas to students, parents, colleagues, and administrators, writing that is original, clear and error-free is a priority for the College of Education. It is expected that work will be turned in on time. Late work will affect the student's grade in the course and will not be accepted after a week. Please discuss individual issues with the instructor.

Professional Organizations and Professional Journals: You should join at least one professional organization and should receive at least one professional journal. There are many organizations in all areas and levels of teaching. Almost all have an educational journal which will provide you with a continuous source of ideas and class activities. Even local organizations, such as the San Diego Science Educators Association have newsletters. Student memberships are less expensive than regular memberships, so join now!

Assignment Descriptions

Reading Responses (due for each chapter)

20 pts.

Students will be assigned readings and should present their outline of the content to each chapter in both of the following forms:

- A Big Ideas paper explaining the key science concepts (linear outline).
- A graphic organizer that demonstrates the key science concepts and their relationships to one another (samples will be provided in class).

The responses may be typed or handwritten, but must be legible. These responses may be the basis for in-class discussion with your colleagues. I will check them off for completion in class each meeting and collect representative samples for closer reading.

Class Project Directorship (Class Jobs)

5 pts.

We operate under the philosophy that classes should be driven by “real work” in the “real world” rather than just assignments. Each student will sign up for a Class Directorship and points given will be based upon the completeness to which the student accomplishes their job. See Directorship Descriptions Handout.

Web Sites and Assignment

5 pts.

For this assignment, we will visit the World Wide Web using Netscape. Each student will find 5 web sites of science activities and type short summaries of what the web sites offer. Additionally, each student will print 5 science lessons from the Web. You may work in groups, but each student must turn in 5 different science lessons and summaries of 5 different web sites.

CA Science Content Standards Activity

10 pts.

Using the CA Science Content Standards for a grade that interests you, each student will prepare a unit outline for that grade level. The outlines will include a BRIEF DESCRIPTION of:

- Key science concepts addressed in the unit.
- Science Content Standards addressed in the unit.
- 5 lessons to support the science concept you are teaching. Each lesson description should include at least four complete paragraphs: one paragraph on each of the following:
 1. Behavioral Objectives
 2. Description of the Exploration Activity
 3. Description of Concept Introduction
 4. Description of Concept Application Activity

Teaching of Hands-on Science Lessons (two group lessons)

20 pts.

You will work in groups to lead science lessons based on the Learning Cycle Model of Instruction. You will teach these to your classmates. Each lesson will be allocated a maximum of 45 minutes of class time to teach. The class 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. You must complete the Exploration and Concept Introduction (Invention) phases during the 45 minutes.

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.

- One person will be responsible for leading the Exploration phase of the lesson.
- One person will lead the Concept Introduction (Invention) phase of the lesson, and will explain the science content background for the activity.
- One person will lead the Concept Application activity.
- One person will explain SDAIE strategies to include with this lesson to meet the learning needs of children whose first language is not English.
- One of the four or five group members will lead a discussion about applications of this science content in everyday life.
- Each group will prepare a handout which includes the 3 stages of the learning cycle, a summary of the science content background, SDAIE strategies, and applications to everyday life. Bring copies of the activity for everyone with group members’ names at the top and references at the bottom of the page. On the first line of the handout, write out the science concept(s) you are teaching in a complete sentence. The second line should state the behavioral objective.
- Additionally, each group will prepare an evaluation instrument to be used by (a) the instructor, (b) 5 class members not in the group, and (c) group members.
- The evaluation instruments should have the group members’ names and topic at the top. The instructor’s copy should include a description of each person’s role in researching the topic and developing the presentation.

Topic Assignments for groups:

Group 1 – Chapters 6 and 13

Group 2 – Chapters 8 and 14

Group 3 – Chapters 9 and 15

Group 4 – Chapters 10 and 16

Group 5 – Chapters 11 and 19

Group 6 – Chapters 12 and 20

Science Activity and Poster for Elementary School Science Fair

10 pts.

You will work with a partner and prepare a hands-on science activity and poster about the activity. You and your partner will present the activity at an Elementary School Science Fair, or in your classroom. Your activity should emphasize a particular science concept(s). Be sure you understand the concept(s) you are emphasizing, and that you can explain it. The activity should be developmentally appropriate for K-6, and should follow the NSTA Safety Guidelines.

You will type the activity to turn in **before the event**. Include your name at the top of the page and references at the bottom of the page. On the first line of the activity, write

out the science concept(s) you are teaching in a complete sentence. On the second line, state the behavior objective for the lesson/activity.

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.

Science Mini-Unit

20 pts.

You will create a unit on a specific science topic. It is important to consider teaching something that will fit into your student teaching experience. Your grade will be based on the following components:

A. Unit Plan

- 1 page - include title, grade level, key concepts, content standards, one-two line descriptions of each lesson

B. 3 Learning Cycle Lesson Plans - Adapt from Commercial Lessons! Do not re-invent activities. For each lesson, include the following:

- Topic
- Science concept(s) taught in the lesson stated in a complete sentence.
- Objectives (use behavioral objectives with action verbs - i.e. The students will ___).
- Exploration Activity - Explain what the students will do.
- Concept Introduction Activity - Explain what students will do and what the teacher will do.
- Concept Application Activity - Explain what students will do and what the teacher will do.
- SDAIE Strategies - Explanation of SDAIE strategies included and how they are used.
- Science Themes - Explanation of science themes included and how they are emphasized.
- Science Process Skills - Explanation of science process skills used and how they're used.

C. Description of an Activity Center to go with Unit

D. Description of Final Project for Unit

E. References

The lessons should include hands-on lessons, and should emphasize particular science concepts. The Exploration and Application phases of the Learning Cycle 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.

Take Home Final

10 pts.

This assignment will be given in class prior to your student teaching, to be completed and turned in by the last class. It will include 4 questions.

Criteria for Grading Assignments

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%

Course Grades

An “A” student is one who:

- completes all assignments on time and demonstrates the ability to summarize, analyze, and/or reflect at high levels.
- varies sources of information for assignments, demonstrating high degree of effort in pursuing varied perspectives around important educational issues.
- completes all the reading assignments and develops thoughtful and thorough responses.
- produces work that reveals a strong commitment to self-discovery and learning.
- produces work at a high professional level in terms of both writing and content.
- develops a high quality presentation, demonstrating significant learning around a contemporary issue.
- presents confidently and intelligently, demonstrating effective teaching skills.
- completes assignments in/out of class with a focus on learning and exploration, pushing him/herself to better understand the profession through quality work.
- attends almost every class meeting and is fully engaged during class.

- pushes him/herself to new understandings by participating in discussions, sharing his/her opinions, and valuing others' perspectives.
- contributes to the positive environment of the class by respecting all members.

A "B" student is one who:

- completes all or almost all assignments, all or most on time, and demonstrates the ability to summarize, analyze, and/or reflect at fairly high levels, showing consistent improvement over time.
- varies sources of information for assignments, demonstrating high degree of effort in pursuing varied perspectives around important educational issues.
- completes all or most of the reading assignments and develops thoughtful and fairly thorough responses.
- produces work that reveals a commitment to self-discovery and learning.
- produces work that is close to professional level in terms of both content and writing, working to develop a strong command of writing, speaking, planning and presenting.
- develops presentations, demonstrating significant learning
- presents confidently and intelligently, demonstrating effective teaching skills.
- completes assignments in/out of class with a focus on learning and exploration, pushing him/herself to better understand the profession through quality work.
- attends almost every class meeting and is regularly engaged during class.
- pushes him/herself to new understandings by participating in discussions, sharing his/her opinions, and valuing others' perspectives.
- contributes to the positive environment of the class by respecting all members.

A "C" student is one who:

- completes or attempts most of the assignments, mostly on time, and demonstrates the ability to do some quality summarizing, analysis, and reflection, showing improvement over time.
- varies sources of information for assignments, demonstrating effort in pursuing varied perspectives around important educational issues.
- completes most of the reading assignments and develops thoughtful and sometimes thorough responses.
- produces work that reveals a commitment to some self-discovery and learning.
- produces work that is not yet at a professional level in terms of both writing and content.
- develops a quality presentation, demonstrating learning around a contemporary issue.
- presents confidently and intelligently, demonstrating some effective teaching skills.
- completes assignments in/out of class with a focus on learning and exploration, pushing him/herself a little to better understand the profession.
- attends most class meetings and is often engaged during class.
- pushes him/herself to some new understandings by participating to a moderate degree in discussions, sharing his/her opinions, and valuing others' perspectives.
- contributes to the positive environment of the class by respecting all members.

A “D” student is one who doesn’t meet all of the minimal standards of a “C” student; “F” is earned by someone who hasn’t completed significant portions of the required work and fails to meet the “C” student standards.

Resources

Journals

Science
Science and Children
Education
Science Education
Science News
Science Scope
The Science Teacher

School Science and Math
Innovations in Science and Technology
Journal of Research in Science Teaching
American Biology Teacher
Physics Teacher
Journal of Chemical Education

Visit <http://enc.org> to see the new web site of Eisenhower National Clearinghouse

The Eisenhower National Clearinghouse (ENC) has recently launched an all-new web site, ENC Online, at <http://enc.org>. ENC, which was established by the U.S.

Department of Education, provides K-12 math and science educators with information about teaching materials, innovative ideas, and professional development.

The content on ENC Online has been organized into four major categories. They are Curriculum Resources, Web Links, Professional Resources, and Topics.

Through Curriculum Resources, teachers can locate teaching or professional development materials using subject words, grade level, cost, and type of material to meet their specific needs.

Teachers have said that the Digital Dozen, a monthly selection of exemplary math and science web sites, is one of their favorite features on the site. It is now found in the Web Links area. (Teacher can now also choose to have Digital Dozen delivered to their email boxes when registering with ENC.) Web Links also includes links to sites offering lesson plans, arranged by math or science topics.

The Professional Resources area is intended to become a part of a teacher's professional support system. A Timesavers section found within the Professional Resources area offers a collection of the most popular professional resources in one place for quick linking and use. Standards and state frameworks are also found under Professional Resources, as are federally funded resources, professional development strategies, and research articles.

ENC has always created projects and publications on relevant topics for teachers. The Topics area arranges hundreds of articles, teacher interviews, and selected curriculum resources and web sites thematically. Key education issues addressed in the Topics area include inquiry and problem solving, integrating educational technology, equity, and assessment. These areas include the materials developed for ENC Focus, our quarterly magazine for math and science educators.

Lastly, visitors will find news and timely information about workshops, student contests, awards and grants, and other developments in math and science education.