

**CALIFORNIA STATE UNIVERSITY, SAN MARCOS**  
**College of Education**  
**EDMS 545**  
Science Education in the Elementary School  
**3 Units**  
**Summer Interns '01**  
**ACD 402**

**Instructor:** Vikki Weissman, MS  
**Phone:** (760)738-0587  
**E-Mail:** [weissman@csusm.edu](mailto:weissman@csusm.edu)  
**Office:**

Joseph Keating, Ph.D  
(760) 750-4321  
jkeating@csusm.edu  
UH 309

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

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, lifelong learning, innovative research and on-going service. Our practices demonstrate a commitment to student-centered education, diversity, collaboration, professionalism, and shared governance.

**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 Description**

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.

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

1. The importance of science education.
2. Enjoyment of science and overcoming the fear of science.
3. Constructivism and the theoretical underpinnings of science teaching.
4. The Learning Cycle Model and Inquiry Teaching.
5. Methods and strategies for teaching science concepts, process skills, and scientific attitudes.
6. Strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs, etc.)
7. Underlying themes of science (as discussed in the CA Science Framework).
8. Science content embedded within the discussion and practice of instructional strategies.
9. Resources for science teaching (people, places, materials, books, technology).
10. National Science Education Standards and State Science Content Standards.
11. Other science education reform documents and connections to the local curriculum.
12. Use of assessments in science (traditional, authentic, portfolios, journals, performance-based).

## BOOKS:

**Required:** Abruscato, J. (2000). *Teaching Children Science. A Discovery Approach*. Needham Heights, MA: Allyn & Bacon.

Keating. *Use of Discrepant Events for Teaching Science*

**Recommended:** *California Content Standards, Grades K-12* ([www.cde.ca.gov/board/board.html](http://www.cde.ca.gov/board/board.html))

Kepler, Lynne. (1996). *A Year of Hands-on Science*.  
New York: Scholastic.

Van Cleave, Janice. (1993). *200 Goopy, Slippery, Slimy, Weird & Fun Experiments*.  
New York: John Wiley.

## REQUIRED GENERAL SUPPLIES:

**"Tool Kit"**--A Ziplock style bag containing the following items.

Do NOT purchase these items especially for this class. Simply bring what you have and everyone can and share items as needed.

- scissors
- small bottle of white glue and a glue stick
- wide-tip colored markers (assorted colors, at least 3)/ crayons or colored pencils
- small stapler
- metric ruler

You will also need to budget for the following:

1. Photocopying
2. Materials for your science demonstration and hands-on activity for the class.

**You are expected to have an e-mail address.** If you do not have one already, go immediately to the Computer Lab and ask for one.

## EXPECTATIONS/COURSE REQUIREMENTS

### **PROFESSIONALISM:**

**Attendance:** Because this course is grounded in activity-based learning, you are expected to attend **ALL** class sessions and to participate in class activities and discussions. A missed class will generally result in a loss of 5 points from your grade. College of Education Policy states that students who miss two classes may not receive an A. Students that miss three classes may not receive a B. If an emergency makes it impossible for you to attend class, please communicate with me as soon as possible, via voice mail or e-mail, to arrange for missed work and possible alternative assignments. Late arrivals to and early departures from class will also be seriously considered in the final grade.

**Punctuality:** **Be in class on time. Return from breaks promptly.** Turn in assignments on their due dates. Assignments turned in late may not receive higher than a C grade.

**Dependability:** Come to class **prepared to discuss required readings** and to participate in discussions actively. When involved in group projects, share your resources and accept accountability for the final outcome by fulfilling your obligations.

**Writing Ability:** All papers should be typed, double-spaced, well-organized and free of grammar and spelling errors. I highly recommend the use of peer editing before turning in final papers. :

**\*\*\*\*Collaboration: Work together in a supportive and mutually beneficial way. Set aside personal agendas to support the group goal. Show respect for others by listening and not interrupting when they are talking, by not whispering while others are speaking, and by seeking to understand and gain from what others are saying.**

**Professional Growth:** You should join at least one professional organization and 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 (NSTA, *Science and Children*). Local organizations, such as the San Diego Science Educators Association, also have newsletters. Student memberships are less expensive than regular memberships, so join now!

### **GENERAL CONSIDERATIONS:**

Additional detailed instructions for assignments are supplied in the appendix and will be discussed by the instructor. Do not start the assignment until you have complete directions.

Do not hesitate to see me before an assignment is due if you need additional explanation or support. Notify me immediately should you have special needs that warrant modification of any assignment.

Be sure all papers are bound together before you hand them in. **Avoid paperclips and folders with side gliders.** Three-ring notebooks and staples are much more reliable.

Students who earn less than a B- on a paper are invited rewrite it, with prior approval from the instructor. The rewrite will be due one week after the original paper was returned to the student.

NOTE: reworked papers will not be eligible for an A grade and are limited to one assignment per student.

Any evidence of cheating or plagiarism of the words or ideas of others as your own will result in a failing grade for that assignment and possibly a failing grade for the course.

**Be sure to keep copies of all work submitted for your own records and keep an up-to-date log of all grades received.**

## **MAJOR ASSIGNMENTS-Weissman**

### **I. PROFESSIONALISM**

**10 points**

In addition to outstanding attendance, excellence in all other areas of professionalism are expected of students earning an A.

## II. GROUP SCIENCE ACTIVITY PRESENTATION 50 points

Students will work in groups of two to plan and lead the class in a 30-minute science activity or investigation chosen from topics in **physical** or **earth** science. See Appendix B for details.

## III. MINI-ASSIGNMENTS 30 points

**Choose 3 of the 10 choices below. (Do not do more than 3 assignments.) Put all of the assignments into a light-weight folder, with a cover sheet, making sure each item is clearly identified. Bring copies of handouts as needed to share with your classmates on the due date.**

### A. Trade Book Assignment

Bring in your favorite children's book with a science theme to share with the class. Write a short summary of the book and explain how you would integrate it in the science curriculum. Xerox the summary for your classmates.

### B. Bulletin Board Assignment

Plan and illustrate a design for an interactive science bulletin board--one that actively involves children in its creation or its use. Along with a sketch, include a short explanation of how you would use the bulletin board in your curriculum. Make handouts to share your idea with your classmates.

### C. World Wide Web Assignment

Browse the World Wide Web and find 3 web sites you would recommend to middle school science teachers. Provide the urls and a short description of each web site. Xerox this information for your classmates. For the instructor also, print 3 science lessons plans that are suitable for a grade level and science topic of your choice.

### D. Science Teacher Journals

Peruse copies of *Science and Children* or *Science Scope*. Photocopy one article that describes an activity to do with children. Choose another article on a current issue in science education, i.e. assessment, equity, standards, etc. Write a short summary of each article and your reaction to it. Many of these journals can now be found on the web.

### E. Science Videos

Tape two or more episodes of children's science programs on television--*Bill Nye*, *Beakman's World*, *Newton's Apple*, *The Magic School Bus*, *3-2-1 Contact*, etc. Write a short summary of each episode and your opinion of its quality and usefulness. Make copies of the summary for your classmates.

### F. Parent Involvement

Find a hands-on science activity that would be appropriate for ALL students in a given classroom too do at home with parent help. Choose one that is safe, interesting, and uses very inexpensive and accessible materials. Create a handout that you would send home with each child, including the appropriate instructions for the activity.

Xerox the handout for your classmates.

### **G. Science Supply Catalog**

Obtain a copy of a science supply catalog (Nasco, Frey, Fischer, Carolina Biological, etc (These can now be found on-line). Assume you have \$300 to spend on supplies to **support your lesson**. Write a purchase order. (Your site should receive copies of these catalogs as well)

### **H. SDCOE Resource Catalog**

Obtain a copy of the SDCOE Catalog that lists available videos, laser discs, models, etc. (<http://avserv.sdcoe.k12.ca.us>) Make a list of available resources that potentially **support your lesson**. (Your site may also have a copy of this catalog in the library)

## **MAJOR ASSIGNMENTS-Keating**

### **I. Discrepant event lesson plan and journal. Directions attached.**

**Note:** When you present your discrepant event in class, bring a copy of your lesson plan for each student in the cohort. At the same time, present to the instructor:

- Copy of your lesson plan.
- Journal entry describing a child's (or children's) response to the discrepant event.
- Two questions (and suggested responses) based on the content or basic concept of your discrepant event and the application of that concept.

**25 points**

### **II. Community resource/field trip project (Pre/During/Post Activities). Directions to be given separately.**

**20 points**

### **III. Problem solving (Superlinks solution and evaluation)**

**20 points**

### **IV. Interdisciplinary Group Problem Solving Project "Invention Convention"**

(see customized text =(20 oral pres. + 20 written pres.)

**40 points**

### **V. After all discrepant events have been presented, an open-note QUIZ will be administered utilizing questions which have been submitted.**

**20 points**

## Grading Policy

### **Grading Scale for Course**

Grade Criteria according to the CSUSM General Catalog

A	Performance at the highest level, showing sustained excellence in meeting all course requirements and exhibiting an unusual degree of intellectual initiative.	90-100%
B	Performance has been at a high level, showing consistent and effective achievement in meeting course requirements	80-89%
C	Performance of the student has been at an adequate level, meeting the basic requirements of the course.	70-79%
D	Performance has been less than adequate, meeting only the minimum course requirements	60-69%

### **Grading Criteria for 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%

### ASSIGNMENT VALUES

Professionalism/Classwork	20
Group Presentation	50
Mini-Assignments (Choose 3)	30
Discrepant Event Lesson Plan & Journal	25
Community resource/Field trip	20
Problem-solving	20
Invention Convention	40
Quiz	20
<b>Total</b>	<b>225</b>

**REMINDER: A MINIMUM GRADE OF B- IS REQUIRED FOR CONTINUATION IN THE TEACHER CREDENTIALING PROGRAM.**

## TENTATIVE COURSE SCHEDULE

Every effort will be made to adhere to the schedule below. Miscellaneous, short in-class and/or homework assignments may be added at the discretion of the instructor.

	<b>Topic and Readings</b>	<b>Assignments Due</b>
July 2	Course and Textbook Overview Assignment Explanations <b><u>Sign-Ups for:</u></b> <b><u>Presentations (groups of 2)</u></b> <b>Demonstration &amp; Presentation by a special guest</b>	I highly recommend that you use the first week to get a solid start on your mini-assignments . Also meet with your presentation group for planning.
July 3	Read Ch. 3-- <i>Science Process Skills</i> Read Ch. 4-- <i>Planning and Managing</i> <b>The Learning Cycle</b> <b>Demonstration &amp; Presentation</b>	
July 9	Read Ch. 5-- <i>Strategies for Discovery</i> <b>California Framework &amp; Standards</b>	<u>Presentation 1 &amp; 2</u>
July 10	Read Ch. 6-- <i>Assessment</i>	<u>Presentation 3 &amp; 4</u>
July 11	Read Ch. 7-- <i>Integrating Science</i>	<u>Presentation 5 &amp; 6</u>
July 12	Read Ch. 9-- <i>Adapting the Curriculum</i>	<u>Presentation 7, 8, 9</u>
July 16	Discrepant Events Open ended science experiments	
July 17	“Odyssey of the Mind”	<u>Student Discrepant Events</u>
July 18	“Invention Convention”	<u>Student Discrepant Events</u>
July 19	Science Kits (FOSS and Toys in Space) Content Quiz	<u>Student Discrepant Events</u>
July 21	Field Trip (9-3) Map and Compass Wild Animal Park	

## Appendix A

### DEMONSTRATION IDEAS

A science teacher may choose to do a demonstration, instead of a hands-on activity for the entire class, for the following reasons:

- Safety Consideration
- Limited Materials
- Limited Time
- Difficulty of Task
- Building Student Interest
- Reinforcement of Key Concepts
- Encouraging Critical Thinking Skills

It is important that you are able to do a science demonstration with confidence and in a manner that assures a positive and meaningful learning experience for all your students. I will model several demonstrations for you and also show you some on videotape.

I suggest that you do a demonstration that you find interesting yourself. Choose a demonstration that you believe will be of benefit to your classmates and that would be helpful in meeting a science standard. I will be bringing in a sample of science activity books to help you glean ideas. Sign up for a given topic as soon as possible to avoid duplication.

Practice the demonstration before you do it for the class. Be sure you have adequate materials and that they are safe and readily available. Make sure everyone can see. Use student helpers whenever possible. Ask thoughtful questions. Involve the entire class.

Provide a handout for the instructor and your classmates that explains and/or illustrates how the demonstration is done. Include the scientific explanation and/or background information.

**Read Abruscato's list of criteria for a good demonstration.** You will receive feedback based on these criteria from both your classmates and your instructor. An evaluation sheet used for grading the demonstrations is on the following page.

Be sure to think through what you will need to clean up after your demonstration.



## Appendix B

### GROUP SCIENCE ACTIVITY PRESENTATION

Students will work in groups of three to plan and lead the class in a **30-minute science** lesson and hands-on activity. An emphasis will be placed on physical and earth science topics. **Be extremely time conscious please.**

Each group will:

- \*Provide the necessary materials for a hands-on activity
- \*Prepare appropriate audiovisual materials
- \*Model a method for grouping the class and assigning tasks
- \*Introduce the lesson (clarify the objectives and set the scene)
- \*Give direct instruction and guided practice for the activity
- \*Address the Learning Cycle
- \*Model effective classroom management (material distribution, clean-up, etc.)
- \*Be prepared to explain relevant science concepts
- \*Model appropriate closure
- \*Debrief the activity
- \*Provide a packet of instructions, background information, worksheets, etc. for each classmate and the instructor. Include your suggestions for related activities and extensions--trade books, software, experiments, art projects, songs, etc.
- \*Provide a description of the contributions of each member of the group, signed by all. See Appendix F.

An evaluation/grading sheet for the group presentation is provided on the next page.

## Group Presentation Evaluation Form

Group Members being Evaluated: \_\_\_\_\_

Topic of Presentation: \_\_\_\_\_

Date of Presentation: \_\_\_\_\_

	Exemplary	Satisfactory	Needs Improvement
Presentation was well organized and showed evidence of serious planning.			
Presenters honored time constraints.			
All group members participated.			
The class was divided into groups effectively.			
Materials were managed efficiently.			
An introduction was used to "set the scene" and included clear objectives.			
Activity instructions were clear and easy to follow. Adequate modeling occurred.			
The Learning Cycle was addressed/modeled.			
Constructivist techniques were used.			
Audiovisual materials were well-planned, easy to see, and useful.			
Presenters had effective responses to questions.			
Presenters considered professional appearance to be important.			
Presenters demonstrated abilities to hold interest, using a variety of presentation strategies.			
Presenters utilized SDAIE techniques. (Sheltered techniques for language learners.)			
Overall Effectiveness			

The best parts of the presentation were \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Suggestions: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Assessment: Definitions, Ideas, and Tips**

(I adapted this from the Chula Vista Junior High Science Demonstration Project)

**Assessment**-a process involving the collection and interpretation of educational data which provides feedback on how well students are learning.

**Authentic Assessment**-assessment that is tied to tasks which have genuine purposes and relate to every day life. What has the student actually learned?

**Performance Assessment**-assessment that focuses on having students demonstrate process skills. What can the student actually do?

**Embedded Assessment**-assessment that is integrated with the curriculum and instruction, not a separate entity. The goal is to have the test look very similar to the normal class activities.

The following are some examples of authentic and performance assessment projects. Some projects could be placed in both categories since there is some overlap in their definitions. The determining factor is that an authentic assessment more closely relates to an activity that students could encounter in a science career.

<b>Authentic</b>	<b>Performance</b>
Menu	Create a plant
Motion Cartoon	Create a creature
Simple Machine Models	Space Post Cards
Portfolios	Prehistoric era newspaper
Atom Models	Food Collage
Molecules Models	Extraterrestrial Project
Book Creation	Biome Cube
Letter to President	Future of the Sun
Storyboard on Electricity	
Newsletter	

**Portfolio**-a purposeful collection of student work that demonstrates student performance

One of the goals of keeping a portfolio can be to give students a **sense of ownership** of their work. The title page or cover of the portfolio is a perfect opportunity for students to add a personal touch. An added benefit is that the teacher gets to know more about the students.

A few examples of title page formats are:

1. an acrostic using the student's name
2. a collage of the student's interests
3. a drawing showing science in the student's life
4. a picture that illustrates something about the student

Another way to personalize portfolios is to have students write a letter of introduction to place in their portfolio. This letter describes the student to someone reading the portfolio. Students include their background, interests, hobbies, and goals.

The **table of contents** gives teachers a chance to help students organize their portfolio and guide their choices of assignments. The table of contents also reflects the teacher's goals for the portfolio, for example, growth over time, skill mastery, etc.

## Sample Portfolio Table of Contents

- \_\_\_ Title Page
  - \_\_\_ Skills Check Off
  - \_\_\_ Letter of Introduction
  - \_\_\_ First Lab Activity: \_\_\_\_\_
  - \_\_\_ First Writing Activity: \_\_\_\_\_
  - \_\_\_ First Creative Work: \_\_\_\_\_
  - \_\_\_ Best Lab Activity: \_\_\_\_\_
  - \_\_\_ Best Writing Activity: \_\_\_\_\_
  - \_\_\_ Best Creative Work: \_\_\_\_\_
  - \_\_\_ Student Choice: \_\_\_\_\_
- 
- 1. (required): \_\_\_\_\_
  - 2. (extra credit): \_\_\_\_\_

### Self-Evaluation Cover Sheets

One of the goals for portfolios is to help students learn to evaluate their own work. Students evaluate the strengths and areas needing improvement in each assignment. Over time they will hopefully learn to self-correct in those areas consistently noted as needing improvement. Students should be encouraged to put some thought and time into completing their cover sheets. They should not simply echo the teacher's feedback on the assignment. Modeling and peer-feedback will help students write more thoughtful and thorough cover sheets.

### Sample Self-Evaluation Cover Sheet

1. Type of Assignment (check one)  
\_\_\_ Lab    \_\_\_ Writing Assignment    \_\_\_ Creative Work    \_\_\_ Other
2. I have chosen to put this item in my portfolio because...
3. I believe the strengths of this item are ...
4. I believe I could improve this assignment by ...
5. The important science concepts in this assignment are ...

\_\_\_\_\_  
Student Signature

### Partial Science Skills Check-Off List Sample

#### Responsibility

- \_\_\_ following directions
- \_\_\_ cleaning up a lab or activity station
- \_\_\_ passing the laboratory safety test
- \_\_\_ wearing goggles conscientiously

#### Laboratory Skills

- \_\_\_ using a microscope
- \_\_\_ using a balance
- \_\_\_ using a graduated cylinder
- \_\_\_ measuring in the metric system
- \_\_\_ using diagrams and illustrations

## Tips for Safety in the Classroom

- I. Teach a structured safety unit, including:
  - A. names and proper names for laboratory equipment
  - B. use and location of all safety equipment (Also water/gas shut-offs)
    1. eyewash (15 minutes)
    2. safety shower
    3. fire blanket and fire extinguisher
    4. goggles and aprons (Be sure goggles are OSHA approved.)
    5. spill kits and first aid kits
    6. broken glass and waste receptacles
  - C. rules for handling and disposing chemicals
  - D. rules for handling hot plates, burners, matches
  - E. rules for handling electricity
  - F. rules for handling
- II. Give a safety test. Keep for your records. Consider giving out a written "lab license".
- III. Have students and parents sign a safety contract.  
Flinn Pharmaceuticals has an excellent free safety rules/safety contract.)
- IV. Display safety posters.
- V. Include safety in all laboratory lessons and document these in your lesson plans.
- VI. Have a safety packet for incoming students.
- VII. Establish consequences for breaking safety rules. Consider giving tickets for infractions. 1st=warning; 2nd=sit out one lab; 3rd=sit out two labs; 4th=lose lab privileges. You will need administrative support for this.
- VIII. Prevention is the key.
  - A. Store all equipment and chemicals appropriately.
  - B. Keep the lab clean.
  - C. Use the safest materials possible. Use the smallest amount possible.
  - D. Develop routines for material distribution and clean-up.
  - E. Allow sufficient time to do experiments. Rushing causes accidents.
  - F. Wear protective clothing. Be good about modeling this.
  - G. Practice evacuation drills. Practice spill clean-up.
  - H. Never allow students to work alone or to do unauthorized experiments.
  - I. Be sure you have adequate ventilation.
  - J. Dispose of waste judiciously and legally.
- IX. Provide anti-bacterial soap, lotion, etc. to encourage thorough hand washing.
- X. Make safety a priority. Make it part of the academic grade.

### Fun Ideas for Studying Safety:

- Make a floorplan of the lab, locating all safety equipment.
- Develop a skit showing the right and wrong way to carry out a procedure.  
(Videotape this if possible.)
- Make safety posters.

Play safety games, i.e. safety jeopardy, etc.  
Do safety demonstrations. Role play emergencies.  
Have students actually try to eyewash, fire blanket, smell liquids appropriately, etc.  
Assign safety monitors. Put lab coats on them.

## Invention Convention Ideas (many adapted from Insights "Invent It")

### Teacher Ideas

Have students write down 20 inventions. List them on the board. Categorize them.

Have students pick one invention and describe how life would be different if it didn't exist.  
What would they substitute?

What invention would you show a caveman?

Pretend you are Thomas Edison and a time machine brought you to the present day. What invention would surprise you the most?

Give students simple objects such as straws, paper clips, or clothespins. How students brainstorm new ways to use them.

Have students write down something that bugs them. Switch papers. Have students describe an invention that would solve the problem.

Have students distinguish between an invention and a discovery. Man discovered fire, air, gold, America, but invented the kite, pencil, radio, etc. Provide lists and have students differentiate between them. Or have students create lists.

Provide the name of a basic invention. have students list other, later inventions that made the product better. Example: CAMERA: flashbulbs, tripods, zoom lenses, timers, filters, meters, automatic focus, polaroid, disposable, etc.

Provide the name of an invention. Have students list problems with that product. Example: PENCIL: breaks easily, hard to erase neatly, needs to be sharpened often.

Inventions help us extend our capabilities. List inventions that help us do things better.  
Example: to be warmer: heater, sweater, mittens, thermal underwear, solar reflector.

Research how patents are given.

Show *Newton's Apple*, Show 201 or Insights *Invent It*.

Books: [Invention of Ordinary Things](#) by Don Wulffson

[Be an Inventor](#) by Barbara Taylor.

Janice Van Cleave's Books offer great ideas too.

## Group Presentation Self-Evaluation

Each partner should summarize his/her contributions to the process of preparing and presenting the presentation, using a “bullet” format. After reviewing what the other partners have written, each partner should sign his/her name when the group is in agreement that the contributions of each member are accurately reflected.

Topic \_\_\_\_\_

Date of Presentation \_\_\_\_\_

Name \_\_\_\_\_

Name \_\_\_\_\_

Signature:

\_\_\_\_\_

Signature:

\_\_\_\_\_

