

# CSUSM MULTISUBJECT CREDENTIAL PROGRAM

## Science Education in the Elementary School - EDMS 545B

1300-15:45 M

California State University San Marcos  
Spring 2002

Dave Reynolds M.A.

Office Hours: T 13:00 to 14:00

or by appointment

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**Required** Teaching Children Science. An Inquiry Approach.

**Textbooks:** By Alfred E. Friedl. NY: McGraw-Hill.

EDMS 545 Elementary Science Methods. Dave Reynolds

Students are also required to attend National Science Teachers Annual Conference at San Diego Convention Center Saturday March 30<sup>th</sup> Or buy a Great Explorations in Math & Science (G.E.M.S.) booklet.

### **Other Good Books:**

Science Matters: Achieving Scientific Literacy, By Robert M. Hazen

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

Any Selection that matches a CA Sci Standard <http://www.lhs.berkeley.edu/GEMS/>

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. Look in 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. 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

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 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 technology in elementary science teaching.
6. Demonstrate confidence in leading and performing investigations designed to teach science concepts, science process skills, and scientific attitudes. .
7. Use authentic assessment methods of assessment to evaluate student learning of science concepts and processes.
8. Design a 3-lesson elementary science teaching unit.
9. Practice strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs.
10. 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 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.

### **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.

**Professionalism:** It is expected that students will come to class prepared to discuss the required readings, submit required assignments, and to participate in class activities. Teacher education is a professional preparation program. Students will be expected to adhere to standards of dependability, academic honesty and integrity, confidentiality, and writing achievement. Because it is important for teachers to be able to effectively communicate their ideas to students, colleagues, parents and administrators, writing that is original, clear and error-free is a priority in the College of Education. It is expected that work will be turned in on time. Absences do not change due dates. Late assignments will receive a 10% reduction in points for each day late. After one week, late assignments will receive no credit.

**Literature Books and Science Activity Books:** I will be bringing in literature books and science activity books to show you. You are encouraged to bring in similar books to share with the class. There are wonderful books at bookstores, museums, education conferences, book fairs, and stores. **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 now is the time to join.

You must go to ACD 202 to activate your CSUSM e-mail account, or provide another email address.

### Course Outline

Class #	Date	Topic	Assignment Due
1	Feb. 4	Course Overview: Why Science? The Learning Cycle Model of Teaching Teaching Science in Inclusive Classrooms Review Syllabus Sign up for Groups-Leadership of Science Activities	
2	Feb. 11	Science Current Event and Teaching Tips CA Science Content Standards Grades K-8 Writing Objectives Using CA Science Standards <u>Learning Cycle Science Lesson: Foss Sound Grade 2</u>	Ch. 1 Reading Response
3	Feb 18.	Meet in computer lab room FCB 106 Science Current Events and Teaching Tips Using Internet Resources in Presentations Writing Objectives and Explanations of Science Concepts.	Ch. 2 Reading Response
4	Feb. 25	Science Current Events and Teaching Tips Exemplary Science Materials Beginning to Teach Science/SDAIE Strategies in Science <u>Learning Cycle Science Lesson: GEMS</u>	Ch. 3 Reading Response
5	March 4	Meet in computer lab room FCB 106 Science Current Events and Teaching Tips Science Resources via the Internet <u>Learning Cycle Science Lesson: Group 1-Magnetism</u>	Ch. 6 & 7 Reading Responses

- |    |   |                               |
|----|---|-------------------------------|
| 6  | March 11 Science Current Events and Teaching Tips<br>Infusing Writing Activities in Science Lessons<br><u>Learning Cycle Science Lesson: Group 2-Sound</u>  | Ch. 8 Reading Response        |
| 7  | March 18 Science Current Events and Teaching Tips<br>Authentic Assessment<br><u>Learning Cycle Science Lesson: Group 3-Light, Color, Lenses</u>   | Ch. 9 Reading Response        |
| 8  | March 25 Science Current Events and Teaching Tips<br>Unit Planning<br><u>Learning Cycle Science Lesson: Group 4-Air and Air Pressure</u><br><u>Learning Cycle Science Lesson: Group 5-Weather/Climate</u> | Ch. 10 & 11 Reading Response  |
|    | March 31 National Science Educators Association Conference  |                               |
| 9  | April 8 Science Elementary Exposition   | Bring Science Activity Center |
| 10 | April 15 Science Current Events and Teaching Tips<br>Science Process Skills<br><u>Learning Cycle Science Lesson: Group 1-Space Science/Sun, Moon, and Stars</u>   | Ch. 13,14 Reading Response    |
| 11 | April 22 Science Current Events and Teaching Tips<br>Authentic Assessments in Science<br><u>Learning Cycle Science Lesson: Group 2-Geology</u>  | Ch. 15 Reading Response       |
| 12 | April 29 Science Current Events and Teaching Tips<br>Biological Descriptions of Disabilities<br><u>Learning Cycle Science Lesson: Group 3-Oceans</u>  | Ch. 16 Reading Response       |
| 13 | May 6 Science Current Events and Teaching Tips<br>Science Projects, Student Research, Science Fairs and Science Safety<br><u>Learning Cycle Science Lesson: Group 4-Plants/Animals</u>                    | Ch.17 & 18 Reading Responses  |
| 14 | May 13 Science Current Events and Teaching Tips<br>State Approved Textbooks<br>CA State Frameworks<br><u>Learning Cycle Science Lesson: Group 5- Nutrition/Fitness</u>                                    | Ch. 19 Reading Response       |
| 15 | May 20 Unit Presentations   | Science Unit                  |

### Course Assignments

1. Reading Responses (due for each chapter)	15%
2. Science Current Events, Teaching Tips & Attendance of NSTA	10%
3. Science Instruction Case Study	15%
4. Leadership of Hands-on Science Lessons (two group lessons)	30%
5. Science Activity Center for Elementary School Science Exposition	10%
6. Science Teaching Unit with Learning Cycle Lessons	20%

Late assignments will be penalized by a 10-point reduction each day they are late.

### Assignment Descriptions

#### **1. READING RESPONSES (ONE PER CHAPTER)**

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

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

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.

#### **Key skills/knowledge:**

For Ch. 1-2, summarize the information.

Beginning with Ch. 3 write about the science content, not the activities.

At what level have you comprehended the science content?

Is your work a summary of the science content presented?

#### **2. Science Current Events, Teaching Tips & Attendance of NSTA Conference or Purchase G.E.M.S. Book**

Each student will share a news article pertaining to science, and on another day you will share a tip on science teaching strategies. You will be assigned dates for each assignment.

You are also required to do one of the following, either attend the National Science Teachers Association conference at the San Diego Convention Center on Saturday March 30 Th. (\$35), Register at <https://ecommerce.nsta.org/2002SND/>

Or

Buy a Great Exploration in Math & Science Booklet (~\$11-25) for future use in your classroom. You can order online at [www.lhsgems.org](http://www.lhsgems.org)

### 3. SCIENCE INSTRUCTION CASE STUDY

In this assignment you will develop a case study of science instruction. It consists of four parts:

1. Your observations, 2. Teacher input, 3. Student input and 4. A synthesis of the other 3 components.

1. Ask an elementary teacher if you can observe 2-3 science lessons in his or her class. Then answer the following:

How would you define science instruction in this classroom?

What are the characteristics of science instruction?

What do the students do during science instruction?

What materials are used?

How often do the students engage in hands-on activities?

How is the classroom organized for science instruction?

What science materials are in the classroom?

What evidence is there of science?

Do you see writing infused within the science lessons? If so, what are some examples?

Are their children in the class who are learning English? What differences and similarities exist for children who are learning English?

Feel free to add more descriptive information in regard to science instruction.

2. After you have answered the above questions find time to interview the teacher, using the following questions.

How do children learn science?

How do you organize instruction so that children learn concepts related to the California science standards?

What are the different activities that you do during science instruction?

How do you group the students during science activities?

How often do you teach science?

How often do the children participate in hands-on science activities?

Do you integrate writing activities into science lessons? What are some examples?

What is the easiest thing about teaching science?

What is the most difficult thing about teaching science?

If you could design the ideal science program, what would be the characteristics of the program?

How do you organize instruction for science in two languages or in a language other than English?

What challenges does this present for you?

How do you adapt instruction for students with special needs? Are their particular techniques or issues related to science teaching and students with special needs?

Feel free to include other questions during the interview. If possible, take a portable tape recorder to record the responses for later transcription, as it is easy to miss some things when you are taking notes. Be sure to ask the teacher if she or he minds if you use the tape recorder, and do not use it if the teacher is hesitant.

3. Ask the teacher if you can hand out the Science Survey to the students in the class. Do **not** have the students put their names on the surveys. Feel free to include other questions on the survey, but do not make it too long for the student to answer. This survey will work with third graders and up; you can try it with second graders but I would suggest reading the questions aloud one at a time for them. If you are working with K, 1 or 2 use the following alternative strategy: Choose approximately 6 students (if you are in a bilingual class choose 3 who have English as their native language and 3 with Spanish

or whatever other language is spoken in the class). Interview each student using the survey questions. Record the answers, if possible, and transcribe the taped interviews.

**Student Survey**

Please answer the following questions. Be flexible and adapt the survey to the level of the students.

Grade level: \_\_\_\_\_ Are you a Boy ρ Girl ρ ?

What language(s) do you speak? English ρ Spanish ρ Other ρ

1. What happens during science in your class? How does your teacher teach you science?
2. How often do you do hands-on science activities in class?
3. What sorts of science activities do you do in class?
4. Do you work in-groups to do science activities? If so, what do you do in the groups? Does each person have a job to do?
5. Do you have science materials to use during science activities? What sorts of materials do you use?
6. What are some of the science topics you have studied this year in science class?
7. Do you like science time? What do you like best about it?
8. Are you a good student in science? What helps you learn best?

4. Examine the three sets of data (your responses, those of the teacher and students) for matches and mismatches. You might want to make a grid to organize the data:

	<b>Me</b>	<b>Teacher</b>	<b>Students</b>
<b>How is science taught?</b>			
<b>How does the teacher teach science?</b>			
<b>Do the students participate in hands-on science activities?</b>			
<b>Adaptations and Accommodations</b>			

Use whatever categories or questions that seems relevant in the left-hand column in order that you may compare and contrast the three points of view regarding science instruction

**Synthesis of Information—Paper you will write**

Using the data you have collected and the match/mismatch chart, type a 2-3-page case study of the science instruction. Turn in your case study along with all surveys, interviews and your own answers to questions.

**Rubric for SCIENCE INSTRUCTION CASE STUDY**

Score	Criteria	Quality of Work			
	<b><u>Surveys</u></b>	All appropriate surveys included, 10 pts.	Nearly all information from survey included. 7 pts.	Missing a lot of information from survey. 4 pts.	No Surveys 0 pt.
	<b><u>Classroom Observations</u></b>	All questions and answers from section 1 included, neat and well written. 20 pts.	Nearly all questions and answers from section 1 included, neat and well written. 18 pts.	More than half of the questions and answers missing, from section 1. Not neat or well written. 10 pts.	More than three fourths of the questions and answers missing, not neat or well written. 5 pt.
	<b><u>Interviews</u></b>	Teacher’s responses to all questions included. If k-2 students were interviewed their responses are included. All work is neat and easy to read. 20 pts.	Teacher’s responses to all questions included. If k-2 students were interviewed their responses are included. Not all work is neat and easy to read. 18 pts.	Missing Teacher’s or k-2 student’s responses to some questions. Not all work is neat and easy to read. 10 pts.	Missing Teacher’s or k-2 student’s responses to most questions. Not all work is neat and easy to read 5 pt.
	<b><u>Case Study</u></b>	Case study includes description of matches and mismatches between you, teacher and students. You compare and contrast the three points of view regarding science instruction 2-3 pages long. 50 pts.	Case study missing a one description of matches and mismatches between you, teacher and students. You compare and contrast two points of view regarding science instruction 2-1 pages long. 40 pts.	Case study missing more than one description of matches and mismatches between you, teacher and students. You don’t compare and contrast the three points of view regarding science instruction 1 page long. 30 pts.	Case study-missing descriptions of matches and mismatches between you, teacher and students. You don’t compare and contrast the three points of view regarding science instruction 1 page long. 20 pts.



#### **4. LEADERSHIP OF HANDS-ON SCIENCE LESSONS (TWO GROUP LESSONS)**

You will work in-groups of three 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 thirty

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 will include hands-on lessons, and will emphasize particular science concepts related to the California Science Standards. 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.

Students are required to show examples of age appropriate children’s literature that could be used to support the students understanding of the concepts. Public libraries are excellent resources for obtaining books.

Resources from the Internet are also a required part of your presentation. Images, movies, simulations, sounds, and other exciting resource are available free over the Internet. Students are responsible for either emailing the instructor the URLs or entering them onto the class computer themselves before the beginning of the presentation. PowerPoint presentations can be used to meet the technology piece of the presentation. The PowerPoint presentations can be emailed to the instructor, or brought to class on a zip disk. Don’t just show web pages, but make them apart of your presentation. Include the URLs in your handout to the class.

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 is addressed.

You need to explain SDAIE strategies to highlight with this lesson to meet the learning needs of children whose first language is not English.

End the lesson with a discussion about applications of this science content in everyday life.

Each group will prepare a handout that includes the 3 stages of the learning cycle, a summary of the science content background, SDAIE strategies, and applications to everyday life. A list of children’s literature and URLs used. Bring copies of the activity (for everyone) with (a) group members’ names at the top and (b) reference at the bottom. \*On the first line, write out the California Science Standard and grade level you are teaching.

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 member’s names, title and science topic at the top. **The instructor’s copy will include a description of each person’s role in researching and presenting.**



	<b><u>Science Content Background</u></b>	Your team provided a thorough explanation of the science content background. 10 pts.	Your team provided a very short explanation of the science content background. 7 pts.	Your team provided an incomplete explanation of the science content background. 4 pts.	Your team provided a poor explanation of the science content background. 1 pt.
	<b><u>SDAIE Strategies</u></b>	Numerous (5-6) SDAIE strategies are explained. 10 pts.	3-4 SDAIE strategies are explained. 7 pts.	1-2 SDAIE strategies are explained. 4 pts.	One SDAIE strategy is explained. 1 pt.
	<b><u>Applications to real life</u></b>	Numerous applications to everyday life are described. 10 pts.	A few applications to everyday life are described. 7 pts.	A couple of applications to everyday life are described. 4 pts.	One application to everyday life are described. 1 pt.
	<b><u>Handout</u></b>	Handout included science standard, 3 stages of Learning Cycle, science content background, SDAIE strategies, applications to real life, URL's & Children's Literature and references. 10 pts.	Handout included 5 or 6 of the 7 components. 7 pts.	Handout included 3 or 4 of the 7 components. 4 pts.	Handout included 1 of the 7 components. 1 pt.
	<b><u>Science Concept Explanation</u></b>	Demonstrated a correct and thorough understanding of the science concept you were teaching. 10 pts.	Demonstrated some understanding of the science concept you were teaching. 7 pts.	Did not demonstrate a correct and thorough understanding of the science concept you were teaching. 4 pts.	Demonstrated a very poor understanding of the science concept you were teaching. 1 pt.

## **7.SCIENCE ACTIVITY/POSTER FOR ELEMENTARY SCHOOL SCIENCE EXPOSITION**

You will prepare a hands-on science activity and poster about a science concept. You will present the activity at our Elementary School Science Exposition. 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.

You should type the activity to turn in. 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. Do not say “The students will \_\_\_\_.” (That is an objective, not a science concept.)\*\*\*\*\*

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.

Everyone must choose a difference science concept to teach. You may choose one that your group led in class for our hands-on science activity.

## Rubric for Activity, Poster and Presentation-Elementary School Exposition

Note: Plan on about 12 minutes to present this lesson to each group of 4 students. Please use the Learning Cycle, and include a mini-exploration, concept invention and application activity.

Score Criteria Quality of Work

	<b><u>Lesson Description</u></b>	Two of the characteristics are present.  5 pts.	Three of the characteristics are present.  8 pts.	Four of the five components are present.  11 pts.	Activity is typed with (a) science concept, (b) materials, (c) procedures, (d) explanation, & (e) resources. 14 pts.
	<b><u>Visual Display</u></b>	Visual display is present, but required little imagination or creativity.  5 pts.	3 sided visual display shows some thoughtfulness and creativity, but does not cause one to take a second look. 8 pts.	3 sided visual display shows creativity and thoughtfulness; has graphics or pictures.  11 pts	3 sided visual display shows great creativity and is thought provoking. Demonstrates concept graphically. 14 pts.
	<b><u>Science Concept</u></b>	Science Concept is not defined.  5 pts.	Science Concept is poorly defined in an incomplete sentence.  8 pts.	Science concept is poorly defined or is correctly defined, not in sentence.  11 pts.	Science concept is correctly defined in a complete sentence.  14 pts.
	<b><u>Materials</u></b>	You have the necessary materials for one student per group to participate in hands-on lesson. 5 pts.	You have a few of the necessary materials for all students to participate in hands-on lesson. 8 pts.	You have most of the necessary materials for all students to participate in hands-on lesson. 11 pts.	You have the necessary materials for all students to participate in the hands-on lesson. 14 pts.
	<b><u>Exploration Science Activity</u></b>	Teacher does a hands-on activity for students.  5 pts.	One of the characteristics is present.  8 pts.	Two of the 3 characteristics are present.  11 pts.	Activity is (a) Hands-on, (b) develop-mentally appropriate, & (c) feasible for all students. 14 pts
	<b><u>Concept Invention</u></b>	No student sharing occurred. A little teacher sharing occurred.  5 pts.	No student sharing occurred. Teacher provided all explanations.  8 pts.	A minimum of student sharing and explaining occurred. Teacher provided some explanation  11 pts	Students shared observations, data and explanations. Teacher provided further explanations and terminology, and tied it all together. 14 pts.
	<b><u>Concept Application Science Activity</u></b>	Teacher does a hands-on activity for students.  5 pts.	One of the characteristics is present.  8 pts.	Two of the 3 characteristics are present.  11 pts.	Activity is (a) Hands-on, (b) develop-mentally appropriate, & (c) feasible for all students. 14 pts.

## 8. SCIENCE TEACHING UNIT

You will create a unit on a specific science topic and Science Standard. You may work in-groups of up to three people. You must bring a stamped, self-addressed manila envelope in order to receive a final grade. The grade will be determined by the unit plan, lessons and your final presentation.

1. Unit Plan (1 page-include title, grade level, California Science Standard addressed, goals for unit, one-two line descriptions of each lesson)
2. 3 Learning Cycle Lesson Plans *Adapt from Commercial Lessons!*  
For each lesson, include the following: *Do not re-invent activities.*
  - a. Topic
  - b. Science Standard or Substandard--Write out the Standard(s) you are teaching in a complete sentence
  - 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 Activity --explain what students will do and what teacher will do
  - f. Concept Application Activity- explain what students will do and what teacher will doFor sections d-f make sure you write out specific instructions, someone should be able to follow your directions and teach the lesson.
3. SDAIE Strategies –explanation of SDAIE strategies included and how they are used
4. Science Process Skills – explanation of science process skills used and how they're used
5. Description of an Activity Center to go with Unit. You may use your Elementary Activity Center.
6. Description of three Authentic Assessments for the Unit, describe the substandard the students will be test on, include a scoring rubric for each.
7. List examples of age appropriate children's literature that could be used to support the students understanding of the concepts.
8. List resources from the Internet. Images, movies, simulations, sounds, and other exciting resource used to support the students understanding of the concepts
9. Description of Final Project for Unit. This is a culminating activity, How will the students either extend their learning or show mastery of the Standard. It could be a presentation to parents, other classes, or a field trip.
10. References

The lessons should include hands-on lessons, and should emphasize particular science concepts that connect to a specific California Science Standard. 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 Teaching Unit Rubric

*To receive a grade, turn in a stamped, self-addressed manila envelope with unit.*

### Score Criteria

### Quality of Work

	<b><u>Science Standard</u></b>	Science Standard or substandard is explained in a complete sentence. 7 pts.	Science Standard or substandard is partially explained in a complete sentence. 5 pts.	Science Standard is not completely written out. 3 pts.	Science Standard is absent. 1 pt.
	<b><u>Objectives</u></b>	One-two behavior objectives with action verbs are written in complete sentences. 7 pts.	Behavioral objectives are poorly written. 5 pts.	Objectives are not behavioral objectives. 3 pts.	Objectives are absent. 1 pt.
	<b><u>Exploration</u></b>	All students participate in developmentally appropriate hands-on science activities, make observations, and collect data in 3 lessons. 7 pts.	Some students participate in developmentally appropriate hands-on science activities, make observations, and collect data in 3 lessons. 5 pts.	Students participate in hands-on science activities, make observations, and collect data in 2 lessons. 3 pts.	Few students participate in hands-on science activities, make observations, and collect data in lessons. 1 pt.
	<b><u>Concept Invention</u></b>	Students share their observations, data and explanations. Teacher provides further explanations and terminology, and ties it all together 7 pts.	A minimum of student sharing and explaining occurs. Teacher provides some explanation. 5 pts.	No student sharing occurs. Teacher provides all explanations. 3 pts.	No student sharing occurs. Little teacher sharing occurs. 1 pt.
	<b><u>Concept Application</u></b>	All students participate in developmentally appropriate hands-on science activities, make observations, and collect data in 3 lessons. 7 pts.	Some students participate in developmentally appropriate hands-on science activities, make observations, and collect data in 3 lessons. 5 pts.	Students participate in hands-on science activities, make observations, and collect data in 2 lessons. 3 pts.	Few students participate in hands-on science activities, make observations, and collect data in lessons. 1 pt.
	<b><u>SDAIE Strategies</u></b>	5-6 SDAIE strategies are explained. 7 pts.	3-4 SDAIE strategies are explained. 5 pts.	1-2 SDAIE strategies are explained. 3 pts.	1 SDAIE strategy is listed. 1 pt.
	<b><u>Literature and Technology</u></b>	3 or more examples of literature, and has numerous examples using technology 10 pts.	2 or more examples of literature, and used technology 7 pts.	1 or more examples of literature, and no technology 4 pts.	No examples of literature, and/or not technology 1 pt.

	<b><u>Science Process Skills</u></b>	Your unit includes a list of the science process skills that students practice in the lessons and an explanation of when they use the skills. 7 pts.	Your unit includes a list of the science process skills, but little explanation of when students use them in the unit. 5 pts.	Your unit includes little information on the process skills. 3 pts.	The process skills are mentioned in your unit, but not explained. 1 pt.
	<b><u>Authentic Assessments</u></b>	Your unit includes 3 authentic assessments and clear explanations of each and scoring rubrics 7 pts.	Your unit includes 3 authentic assessments and scoring rubrics, but it is not clear how they will be done or how they assess learning from the unit. 5 pts	Your unit includes 2 authentic assessments and scoring rubrics and explanations. 3 pts.	Your unit includes one authentic and scoring rubric assessments and explanation. 1 pt.
	<b><u>Activity Center</u></b>	Your unit includes a complete description of an activity center, including procedures to set it up, necessary components, and an explanation of what students will do and learn. 7 pts.	Your unit includes a description of an activity center, procedures and components, but little explanation of what students will do and learn. 5 pts	Your unit includes a description of an activity center, but few procedures, components or explanation of what students will do and learn. 3 pts.	Your unit includes the title of an activity center. 1 pt.
	<b><u>Final Project</u></b>	Your unit includes a description of a final, culminating project; description of how you will plan & make arrangements for it; and an explanation of how it ties the unit together. 7 pts.	Your unit includes a description of a final project and planning information, but no explanation of how the final project ties the unit together. 5 pts	Your unit includes a description of a final project, little planning information and little explanation of how it ties the unit together. 3 pts.	Your unit includes a title of a final project. 1 pt.
	<b><u>References</u></b>	Your unit includes complete references you used from other sources. 7 pts.	Your unit includes a list of references, but not complete information. 5 pts	Your unit includes very little reference information. 3 pts.	Only reference titles are included. 1 pt.
	<b><u>Presentation</u></b>	Your presentation was outstanding. Your explanations showed evidence of a thorough understanding of the topic and teaching applications. 14 pts.	Your presentation was well done, and showed that you had an understanding of most aspects of the topic and teaching applications. 10 pts.	There was some evidence of planning and practice You had a limited understanding of the topic and teaching applications. 6 pts.	You did a presentation, but there was little evidence of planning, practice and understanding of the topic. 2 pts.