

CALIFORNIA STATE UNIVERSITY SAN MARCOS
COLLEGE OF EDUCATION
EDMS 545B – Science Education in Elementary School
Mondays 1.00 – 3.45 p.m. UH 460

General Information:

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Other times are also available by appointment so please feel free to call or e-mail me to set up a convenient time to meet.

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.

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

Learning from Cases: Unraveling the Complexities of Elementary Science Teaching. By Tippins D. J., Koballa T. R. & Payne B. D. Boston, MA: Allyn & Bacon.

Other handouts may be distributed in class or through WebCT (WebCT: <http://courses.csusm.edu/>)

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

Teaching Science as Inquiry. By Arthur Carin & Joel Bass. Columbus OH, Prentice Hall.

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

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

Great Explorations in Math & Science (G.E.M.S.). Lawrence Hall of Science.
<http://www.lhs.berkeley.edu/GEMS/>

Activities Integrating Math and Science. Aims Education Foundation.
<http://www.aimsedu.org/aimscatalog/default.tpl>

These and many other hands-on science books are in bookstores, museums, zoos, 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 team 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 into the course.

COURSE OBJECTIVES

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

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

INFUSED COMPETENCIES

Authorization to Teach English Learners

This credential program has been specifically designed to prepare teachers for the diversity of languages often encountered in California public school classrooms. The authorization to teach English learners is met through the infusion of content and experiences within the credential program, as well as additional coursework. Students successfully completing this program receive a credential with authorization to teach English learners.

(Approved by CCTC in SB 2042 Program Standards, August 02))

Special Education

Consistent with the intent to offer a seamless teaching credential in the College of Education, this course will demonstrate the collaborative infusion of special education competencies that reflect inclusive educational practices.

Technology

This course infuses technology competencies to prepare our candidates to use technologies, emphasizing their use in both teaching practice and student learning.

COURSE REQUIREMENTS

COE Attendance Policy

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. 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.

For this class, if you miss 2 class sessions or are late (or leave early) for three or more sessions, your highest possible grade is a B. If you miss 3 class sessions, your highest possible grade is a C. If you miss more than 20% of the class (3 class sessions), you may not receive a passing grade for the course. Absences do not change assignment due dates. Late assignments will receive a 20% reduction in points for each day late. After one week, late assignments will receive no credit.

Writing

In keeping with the All-University Writing Requirement, all courses must have a writing component of at least 2,500 words (approximately 10 pages), which can be administered in a variety of ways.

Students with Disabilities Requiring Reasonable Accommodations

Students are approved for services through the Disabled Student Services Office (DSS). This office is located in Craven Hall 5205, and can be contacted by phone at (760) 750-4905, or TTY (760) 750-4909. Students authorized by DSS to receive reasonable accommodations should meet with their instructor during office hours or, in order to ensure confidentiality, in a more private setting.

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

TOPICS OUTLINE

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

COURSE ASSIGNMENTS

- | | |
|------------------------------------------------------------------------|-----|
| 1. Participation, Collaboration and Professionalism (Individual) | 5% |
| 2. Discussion Questions (individual) | 10% |
| 3. Reading Responses (Individual) | 5% |
| 4. Leadership on Hand-on science lesson (May work in pairs) | 25% |
| 5. Science Instruction Case Study (may work in pairs) | 25% |
| 6. Science Exposition Lesson Plan and Presentation (may work in pairs) | 10% |
| 7. Science Teaching Unit and Presentation (Capstone Teams) | 15% |
| 8. Science Teaching Notebook (Individual) | 5% |

**Late assignments will be penalized by a 20-point reduction each day they are late.
 Keep digital copies of all assignments for your Credential Program Electronic Portfolio.**

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%

Grades will be determined by points earned:

A = 93-100	C+ = 77-79
A- = 90-92	C = 73-76
B+ = 87-89	C- = 70-72
B = 83-86	D = 60-69
B- = 80-82	F = 0-59

ASSIGNMENT DESCRIPTIONS

1. PARTICIPATION, COLLABORATION AND PROFESSIONALISM (individual)

Students will engage in active learning each class session, and will be expected to actively participate, collaborate, and demonstrate professionalism at all times.

- Do you participate in class discussions productively, sharing your knowledge and understandings?
- Do you interact productively with your peers, taking on a variety of roles (leader, follower, etc.)?
- Do you contribute appropriately to group work—do you “do your share”?
- Are you able to accept others’ opinions?
- Are you supportive of others’ ideas?
- Do you support your peers during their presentations?
- Can you monitor and adjust your participation to allow for others’ ideas as well as your own to be heard?
- Do you show a positive attitude and disposition towards teaching all students?
- Do you exhibit professional behavior at all times?
- Do you attend each and every class, arrive on time and well prepared in all aspects, and do not ever leave early?
- Do you give close attention to each activity and speaker, and never whisper or do other things while there is a speaker?

You will do a self assessment using the Rubric for Participation, Collaboration and Professionalism; and write a two-three page rationale. You should give a rationale for the points you gave yourself in each area of the rubric and provide examples for each area. Your professor will also do an assessment using this rubric. Turn in your Rubric and Rationale with examples.

Rubric for Participation, Collaboration and Professionalism

CATEGORY	Excellent 14 pts.	Acceptable 9 pts.	Unacceptable 4 pts.	Your Score
Attitude	Always has a positive attitude. Never is critical of the task or others without offering alternatives, showing initiative, and working hard for improvement.	Usually has a positive attitude. Rarely is critical.	Seldom has a positive attitude. Often is critical.	
Participation	Attends every class, always on time and well prepared, never leaves early. Give closest attention to class activities and speakers.	Usually attends every class, on time and prepared, doesn't leave early. Give most attention to class activities and speakers.	Is not always ready when class time begins. Doesn't give full attention in class; sometimes talks when others are speaking.	
Professionalism	Always behaves, talks and works in a professional manner, regardless of task/topic.	Often behaves, talks and works in a professional manner, regardless of task or topic.	Seldom behaves, talks and works in a professional manner, regardless of task/topic.	
Collaboration	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Is not always a good team player.	
Contributions	Always provides useful ideas; always stays focused on the task. Exhibits a lot of effort and valuable contributions.	Often provides useful ideas; stays focused most of the time. A satisfactory group member who does what is required.	Rarely provides useful ideas; not always focused. Reluctant to participate. Lets others take charge and participate.	
Disposition toward Teaching	Always demonstrates concern in learning to teach all children. Always demonstrates strong commitment toward developing (a) an understanding of children, (b) teaching strategies, and (c) knowledge of the CA Standards for the Teaching Profession and CA Science Content Standards.	Often demonstrates concern in learning to teach all children. Often demonstrates commitment toward developing (a) an understanding of children, (b) teaching strategies, and (c) knowledge of the CA Standards for the Teaching Profession and CA Science Content Standards.	Rarely shows concern in learning to teach all children. Rarely demonstrates commitment toward developing (a) an understanding of children, (b) teaching strategies, and (c) knowledge of the CA Standards for the Teaching Profession and CA Science Content Standards.	
Leadership	Shows strength through leadership in different class activities; other students respect you as a leader.	Effectively participates and contributes, but rarely shows leadership qualities.	Does not show leadership in any area of class.	

Total Score: _____

2. DISCUSSION QUESTIONS: (Based on Readings from Learning from Cases Text)

Each student will be required to submit a discussion question for the class based on the readings of the assigned chapters from the book *Learning from Cases*. The question should be submitted to the instructor via email by noon on the day of the class when such readings are assigned. The discussion question should be an open-ended question that provides opportunity for discussion and calls for diverse responses. In addition it should reflect that you read the assigned readings. The dates when the questions are due are reflected in the course schedule. Examples of such questions will be available on WebCT

3. READING RESPONSES (Readings from Friedl's text) (individual)

Some readings are assigned from the text *Teaching Children Science: An Inquiry Approach*. For each assigned chapter in this text students will present their TYPED responses to each specific assigned reading 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 or a graphic organizer that demonstrates the key science concepts and their relationships to one another
- C. Implications – What does this say about teaching children science?

Responses should be 1-2 pages and TYPED. Make the most of the space. Use a standard font, such as Helvetica, Time or Times New Roman 10 or 12 point.

NOTE: The reading responses are **only** for chapters from Teaching Children Science text and **not** from learning from the cases text.

4. LEADERSHIP OF HANDS-ON SCIENCE LESSONS – Critical Assessment Task (CATs)

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

You will lead science lessons based on the Learning Cycle Model of Instruction. You will teach this to your classmates. Each lesson will be allocated 20 minutes of class time to teach and 10 minutes for discuss and feedback from your classmates. Your classmates will not role-play elementary students, but will learn the science content and how to teach it. Treat your classmates as teachers, not elementary students.

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

Be sure you understand the concepts you are emphasizing, and that you can explain them. The lessons should be developmentally appropriate for K-6, and should follow the NSTA Safety Guidelines. Begin the lesson by writing two essential questions about the lesson on the board, for students to consider during the lesson. Make sure that you include the 3 stages of the Learning Cycle. Make sure that science content background and applications to everyday life are addressed. You need to explain SDAIE strategies and adaptations for students with disabilities.

Prepare a **Powerpoint Computer Presentation** to use in your lesson. The presentation should include a detailed explanation of the science content, as well as a list and definitions of science concepts important to the lesson. Additionally, include a list of at least 5 web sites (with short descriptions) that address the science topic and concepts through simulations, graphics and movies. You should have links to these web sites and show examples during the lesson. ****You need to email the presentation to the instructor 2 days prior to your presentation.**

Prepare a Science Lesson Handout which includes the following:

- a. Learning Objective(s) written in complete sentences. “The students will _____.”
Use an action verb and explain how students will demonstrate their new knowledge and understanding.
- b. Science Concept(s) and definitions(s) written in complete sentences.
Do not say “The students will _____.” (That is an objective, not a science concept.)
- c. California Science Content Standard(s) which may be addressed, along with grade level.
- d. Exploration Activity
- e. Concept Introduction (also called Concept Invention)
- f. Concept Application Activity

- g. SDAIE strategies
- h. Adaptations for students with disabilities
- i. A 1-2 page summary of the science content background
- j. A list of 5 relevant web sites (with descriptions)
- k. Applications to everyday life.
- l. Two higher thought questions that you want students to be able to answer by the end of your lesson:
 - a. One MAIN IDEA question
 - b. One APPLICATION question

INCLUDE ONLY THE QUESTIONS, NOT THE ANSWERS.

Bring copies of the activity for everyone in class.

5. SCIENCE INSTRUCTION CASE STUDY (may work in pairs)

Students will develop a case study of science instruction involving input from classroom observations, a K-8 teacher or teachers and K-8 students. It will include 5 parts: your observations, teacher interview, student surveys, chart comparison, and case study paper. Carefully read A-F below.

Observations of Science Lessons

- A. Ask an elementary teacher if you can observe 2-3 science lessons in his or her class. Then answer the following:
1. How would you define science instruction in this classroom?
 2. What are the characteristics of science instruction?
 3. What do the students do during science instruction?
 4. What materials are used?
 5. How often do the students engage in hands-on activities?
 6. Do they each participate and have a role?
 7. How is the classroom organized for science instruction?
 8. What science materials are in the classroom?
 9. What evidence is there of science?
 10. Do you see writing infused within the science lessons? If so, what are some examples?
 11. Are there 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.

- B. After you have answered the above questions find time to interview the teacher.. Ask the teacher to answer the Teacher Survey. Please inform the teacher that the school and district will not be identified, only the grade level. Please do not put the teacher's name on the survey.

Teacher Survey

1. How do children learn science?
2. How do you organize instruction so that children learn concepts related to the California science standards?
3. What are the different activities that you do during science instruction?
4. How do you group the students during science activities?
5. How often do you teach science?
6. How often do the children participate in hands-on science activities?
7. Do you integrate writing activities into science lessons? What are some examples?
8. What is the easiest thing about teaching science?
9. What is the most difficult thing about teaching science?
10. If you could design the ideal science program, what would be the characteristics of the program?
11. How do you organize instruction for science in two languages or in a language other than English? What challenges does this present for you?
12. How do you adapt instruction for students with special needs? Are there 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.

- C. Ask the teacher if you can hand out the Student 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 students 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. Be flexible and adapt the survey to the level of the students.

Student Survey

Please answer the following questions.

Grade level: _____ Are you a Boy Girl ?

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

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?

- D. Examine the three sets of data (your observations, those of the teacher and students) for matches and mismatches. Create a grid to organize the data:

Comparison Chart

	My Observations	Teacher Interview	Student Surveys
How is science taught/what happens during science time?			
How does the teacher teach science/what does the teacher do?			
Do the students participate in hands-on science activities?			
Adaptations and Accommodations			

- E. Using the data you have collected and the match/mismatch chart, type a 2-3 page CASE STUDY PAPER of the science instruction.
- F. Turn in 2 copies of the following. Staple all together in the following order with the Case Study paper on top.

1. Your 2-3 page CASE STUDY PAPER.
2. Your own answers to questions (in A above) as you observed in the classroom
3. Teacher Interview questions (B above) and answers
4. Student Surveys (C above) with student answers
5. Comparison Chart (D above) of your observations, teacher interview answers and student survey answers.

6. SCIENCE EXPOSITION LESSON PLAN AND PRESENTATION WITH SCHOOL AGE CHILDREN – Critical Assessment Task (CATs)

Develop an inquiry activity to teach to elementary students. You may work in pairs on this assignment.

You will prepare a hands-on science lesson and poster about a science concept. You will present the lesson 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. Prior to teaching the lesson, turn it in to your instructor for review. After teaching the lesson, turn in a copy of your Reflection. The lessons should include hands-on lessons, and should emphasize particular science concepts. The Exploration and Application phases of the Learning Cycle must require different hands-on science activities using manipulatives. Hands-on activities are NOT reading or completing worksheets (though they may require students to read something or complete lab observation sheets). You should take the activities “off of paper” and require students to use the science process skills with science manipulatives.)

Turn in your typed Lesson Plan with your names at the top and REFERENCES at the bottom.

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

7. SCIENCE TEACHING UNIT AND PRESENTATION– Critical Assessment Task (CATs)

(May work in teams assigned to the Capstone Project: ID 381)

You will create a typed unit on a specific science topic. You must bring a stamped, self-addressed manila envelope in order to receive a final grade.

The goal of this assignment is for you to think of how you can transform scientific research work that you general from the Capstone Project into a teachable elementary science unit of instruction. The unit plan will be related to the study you conduct as part of your capstone assignment.

Unit Components:

1. Unit Plan (1 page; include title, grade level, goals for unit, Calif. Science Content Standards addressed, and one-two line descriptions of each learning cycle lesson)
2. Essential Questions
3. Authentic Assessment
4. Rubric for Assessment (see rubric.forteachers.org for assistance)
5. 3 or more Learning Cycle Lesson Plans

For each lesson, include the following

- a. Topic
- b. Science Concept you are teaching. Write out the science concept(s) (and definitions) you are teaching in a complete sentence. Do not say “The students will ____.” (That is an objective, not a science concept.)
- c. California Science Content Standards addressed

- d. Objectives (1-2) (use behavioral objectives with action verbs—i.e., The students will ____)
 - d. Exploration Activity- explain what students do and teacher does
 - e. Concept Introduction (also called Concept Invention)--explain what students do and teacher does
 - f. Concept Application Activity- explain what students do and teacher does
6. Science Content Background for the teacher (2-3 PAGES—typed)
 7. List and short descriptions of 5 Web Sites (with short descriptions) that address the science topic and concepts through simulations, graphics and movies.
 8. SDAIE Strategies and explanation of how they are used
 9. Adaptations for Students With Disabilities and explanation of how used
 10. 3 Ways to Integrate Technology and Explanation of how used
 11. References

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

You will present your unit as part of the final Capstone Project PowerPoint presentation and turn in a complete unit as well as a copy of the capstone project for grading.

8. SCIENCE TEACHING NOTEBOOK (individual)

You will keep a class notebook, and will meet with the instructor during the last class period to review contents. Please use section dividers and labels for sections. For some assignments, you may need to make copies in order to include everything in your notebook.

- I. California Science Content Standards for grades K-8 (download from <http://www.cde.ca.gov/board/pdf/science.pdf> and print)
- II. Reading Responses
- III. Learning Cycle Lessons presented in class
 - a. Lesson Plan Handout
 - b. Learning Log for each lesson
- V. Science Instruction Case Study
 - a. Case Study Paper
 - b. Your Observations
 - c. Teacher Interview
 - d. Student Surveys
- VI. Science Unit Plan and Capstone Project Report
- VII. Other Class Handouts

RESOURCES

JOURNALS

Science	Science Scope	Physics Teacher
Science and Children	The Science Teacher	Journal of Chemical Education
Science Education	School Science and Math	Innovations in Science & Technology Education
Science News	American Biology Teacher	Journal of Research in Science Teaching

EISENHOWER NATIONAL CLEARINGHOUSE <http://enc.org>

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.

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.

Tentative Course Outline

Class #	Date	Topic
1	1/26	Course Overview: What is Science? The Nature of Science and Inquiry Process in Science Review Syllabus Sign up for Leadership of Science Activities
2	2/2	Teaching Tips: Constructing Knowledge and Discovering Meaning through the Learning Cycle <i>Read Chapter 1 & 2 Learning from Cases & Learning Cycle Handout</i> Discussion Question Due
3	2/9	Teaching Tips: Inquiry Processes in Science Writing Objectives Using CA Science Standards <i>Read Chapter 3 of Learning from Cases.</i> Question Due
4	2/16	Teaching Tips: Planning and Managing Inquiry based Lessons Writing Objectives and Explanations of Science Concepts. <i>Read Chapter 4 of Learning from Cases</i> Question Due
5	2/23	Teaching Tips: Using Cooperative strategies & questioning and Wait time as a Learning tools <i>Read Chapter 1 & 3 of Teaching Children Science</i> <i>Learning Cycle Lesson Presentations</i> Reading Response Due
6	3/1	Case Study Observations – No class meeting <i>Read Chapters 6 & 7 of Teaching Children Science</i>
7	3/8	Teaching Tips: Assessment of Understanding and Inquiry <i>Read Chapter 7 of Learning from Cases</i> <i>Learning Cycle Lesson Presentations</i> Question Due Reading Response Due for Chaps 6 & 7 of TCS
8	3/15	Teaching Tip: Integrating Science with other subjects <i>Read Chapter 2 & 9 of Teaching Children Science</i> Reading Response Due <i>Learning Cycle Lesson Presentations</i>
9	3/22	Teaching Tips: Science WebQuests <i>Read Chapter 8 of Learning from Cases</i> Question Due <i>Learning Cycle Lesson Presentations</i>
10	3/29	No Class Spring Break
11	4/5	Teaching Tips: Adapting Science curriculum for children with Special Needs <i>Read Chapter 5 of Learning from Cases</i> Question Due Science Exploratorium Lesson Due <i>Learning Cycle Lesson Presentations</i>
12	4/12	Science Exposition Day; Live Oak Elementary School- Fallbrook <i>Read Chapter 12 of Teaching Children Science</i>
13	4/19	Teaching Tips: Science Projects, Student Research, Science Fairs and Science Safety

Read Chapters 17 & 18 of Teaching Children Science
Learning Cycle Lesson Presentations
Reading Response Due
Case Study Due

- | | | |
|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14 | 4/26 | Teaching Tips: Teaching for Understanding & Professional Development for Elementary Science Teachers
<i>Read Chapter 6 & 10 of Learning from Cases</i>
<i>Learning Cycle Lesson Presentations</i>
Question Due
Unit Plans Due
PCP Rubric Due |
| 15 | 5/3 | Teaching Tips: State Approved Textbooks
Contemporary Issues in Science Education
<i>Read Chapter 9 of Learning from Cases</i> |

SCIENCE METHODS GRADESHEET

<u>Assignments</u>	<u>Percent of Grade</u>	<u>Your Grade</u>	<u>Points for Final Grade</u>
1. Participation, Collaboration, Professionalism	10%	_____	x 0.10 = _____
2. Reading Responses	15%	_____	x 0.15 = _____
3. Discussion Questions	10%	_____	x 0.10 = _____
4. Science Instruction Case Study	25%	_____	x 0.15 = _____
5. Leadership of Hands-on Science Lessons	25%	_____	x 0.15 = _____
6. Science Lesson Exposition	10%	_____	x 0.05 = _____
7. Science Teaching Unit and Presentation	15%	_____	x 0.15 = _____
8. Science Teaching Notebook	5%	_____	x 0.05 = _____

FINAL GRADE = _____

3. What did the instructors do to facilitate learning?

4. What did you have difficulty with?

Notes:

Appendix B: RUBRIC FOR LEADERSHIP OF HANDS-ON SCIENCE LESSONS

Name: _____

Score Criteria Quality of Work

_____	<u>Materials</u>	Materials were provided so that all students could easily participate. 9 pts.	Materials were provided so that some students could easily participate. 6 pts.	Materials were provided so that a few students could easily participate. 3 pts.	Materials were not provided so that students could easily participate. 0 pt.
_____	<u>Concept Exploration</u>	All students participated in a developmentally appropriate hands-on science activity, made observations, and collected data. Predictions were made at beginning. 9 pts.	Some students participated in a developmentally appropriate hands-on science activity, made observations, and collected data. 6 pts.	A minimal number of students participated in a hands-on science activity, made observations, and collected data. 3 pts.	None of the students participated in a hands-on science activity, made observations, and collected data. 0 pts.
_____	<u>Concept Invention</u>	Students shared their observations, data and explanations. Teacher provided further explanations and terminology, and tied it all together. 9 pts.	A minimum of student sharing and explaining occurred. Teacher provided some explanation. 6 pts.	No student sharing occurred. Teacher provided all explanations. 3 pts.	No student sharing occurred. Little teacher sharing occurred. 0 pts.
_____	<u>Science Content Background during Concept Invention</u>	Your team provided a thorough explanation of the science content background in the PP presentation. 9 pts.	Your team provided a short explanation of the science content background. 6 pts.	Your team provided an incomplete explanation of the science content background. 3 pts.	Your team provided a poor explanation of the science content background. 0 pts.
_____	<u>Relevant Web Sites during Concept Invention</u>	Your PP presentation included 5 web sites with descriptions and links to the sites. 9 pts.	Your PP presentation included 4 web sites with descriptions and links to the sites. 6 pts.	Your PP presentation included 2 web sites with descriptions & links 3 pts.	Your PP presentation included no web sites with descriptions & links. 0 pts.
_____	<u>Concept Application</u>	All students participated in a developmentally appropriate hands-on science activity, made observations, and collected data. 9 pts.	Some students participated in a developmentally appropriate hands-on science activity, made observations, and collected data. 6 pts.	A minimal number of students participated in a hands-on science activity, made observations, and collected data. 3 pts.	None of the students participated in a hands-on science activity, made observations, and collected data. 0 pts.

_____	<u>SDAIE Strategies</u>	Numerous (5-6) SDAIE strategies are explained. 9 pts.	3-4 SDAIE strategies are explained. 6 pts.	1-2 SDAIE strategies are explained. 3 pts.	No SDAIE strategies are explained. 0 pts.
_____	<u>Applications to real life</u>	5-6 applications to everyday life are described. 9 pts.	3-4 applications to everyday life are described. 6 pts.	1-2 applications to everyday life are described. 3 pts.	No applications to everyday life are described. 0 pts.
_____	<u>Adaptations for Students with Disabilities</u>	5-6 adaptations to meet the needs of students with disabilities are included. 9 pts.	3-4 adaptations to meet the needs of students with disabilities are included. 6 pts.	1-2 adaptations to meet the needs of students with disabilities are included. 3 pts.	No adaptations to meet the needs of students with disabilities are included. 0 pts.
_____	<u>Handout</u>	Handout included objective(s), science concept definition, CA Science Content Standards(s), 3 stages of Learning Cycle, SDAIE strategies, adaptations for students with disabilities, science content background, relevant web sites, applications to real life, 2 questions and references. 9 pts.	Handout included 7-8 of the 11 components. 6 pts.	Handout included 3-4 of the 11 components. 3 pts.	Handout included 0 of the 11 components. 0 pts.
_____	<u>Timing</u>	Your team was ready to present at the beginning of class, had all materials ready and all handouts copied, and stayed within the 45-55 minutes allocated. You kept students on-task and did not waste time. 9 pts.	Your team accomplished some of the items listed. 6 pts.	Your team accomplished few of the items listed. 3 pts.	Your team did not accomplish any of the items listed. 0 pts.

APPENDIX C: SCIENCE TEACHING UNIT RUBRIC

Name: _____

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

Score Criteria Quality of Work

_____	<u>Unit Plan</u>	Unit plan was included, with title, grade level, goals, standards, lesson descriptions. 6 pts.	Unit plan included some, but not all, of the components. 4 pts.	Unit plan was very brief and did not include all components. 2 pts.	No unit plan was included. 0 pt.
_____	<u>Science Concept</u>	Science concept(s) is/are correctly defined in complete sentence(s). 6 pts.	Science concept is/are poorly defined, or correctly defined but not in complete sentence(s). 4 pts.	Science concept(s) is/are poorly defined in incomplete sentence(s). 2 pts.	Science concept(s) is/are not defined. 0 pt.
_____	<u>CA Science Content Standard(s)</u>	Science Standard(s) is/are included and completely stated. 6 pts.	Science Standard(s) briefly stated. 4 pts.	Science Standard is alluded to, but not stated. 2 pts.	No Science Standards are included. 0 pt.
_____	<u>Objectives</u>	Behavior objectives with action verbs are written in complete sentences. 6 pts.	Behavioral objectives are poorly written. 4 pts.	Objectives are not behavioral objectives. 2 pts.	Objectives are absent. 0 pt.
_____	<u>Exploration</u>	All students participate in developmentally appropriate hands-on science activities, make observations, and collect data in all lessons. 6 pts.	Some students participate in developmentally appropriate hands-on science activities, make observations, and collect data in all lessons. 4 pts.	A few students participate in hands-on science activities, make observations, and collect data in 2 lessons. 2 pts.	No students participate in hands-on science activities, make observations, and collect data in lessons. 0 pt.
_____	<u>Concept Invention</u>	Students share their observations, data and explanations. Teacher provides further explanations and terminology, and ties it all together 6 pts.	A minimum of student sharing and explaining occurs. Teacher provides some explanation. 4 pts.	No student sharing occurs. Teacher provides all explanations. 2 pts.	No student sharing occurs. Little teacher sharing occurs. 0 pt.
_____	<u>Concept Application</u>	All students participate in developmentally appropriate hands-on science activities, make observations, and collect data in all lessons. 6 pts.	Some students participate in developmentally appropriate hands-on science activities, make observations, and collect data in all lessons. 4 pts.	Few students participate in hands-on science activities, make observations, and collect data in 2 lessons. 2 pts.	No students participate in hands-on science activities, make observations, and collect data in lessons. 0 pt.
_____	<u>Alternative Assessments And Rubric</u>	You included alternative assessments, clear explanations of each, and rubrics. 6 pts.	You included a list of assessments and rubrics, but no explanation. 4 pts.	You included one assessment and one rubric. 2 pts.	You did not include alternative assessments or rubrics. 0 pt.

	<u>SDAIE Strategies</u>	Numerous (5-6) SDAIE strategies are explained. 6 pts.	3-4 SDAIE strategies are explained. 4 pts.	1-2 SDAIE strategies are explained. 2 pts.	1 SDAIE strategy is listed. 0 pt.
	<u>Adaptations for Students with Disabilities</u>	Numerous (5-6) adaptations for working with students who have disabilities are explained. 6 pts.	3-4 adaptations for working with students who have disabilities are explained. 4 pts.	3-4 adaptations for working with students who have disabilities are explained. 2 pts.	No adaptations for working with students who have disabilities are explained. 0 pts.
	<u>Ways to Integrate Technology</u>	You included 3 ways to integrate technology into the unit, with explanations. 6 pts.	You included some information on how to integrate technology into the unit. 4 pts.	You included a list of ways to integrate technology into the unit but no explanations. 2 pts.	You included no ways to integrate technology into the unit. 0 pt.
	<u>Science Content Background</u>	A thorough explanation of the science content background was included. 6 pts.	Some science background was included. 4 pts.	A very brief explanation of the science content background was included. 2 pts.	No explanation of the science content background was included. 0 pt.
	<u>Web Sites</u>	Your PP presentation included 5 web sites with descriptions and links to the sites. 6 pts.	Your PP presentation included 4 web sites with descriptions and links. 4 pts.	Your PP presentation included 2 web sites, but not descriptions or links. 2 pts.	Your PP presentation included 0 web sites with descriptions and links to the sites. 0 pt.
	<u>References</u>	Your unit includes complete references. 6 pts.	Your unit includes a list of references, not complete info. 4 pts.	Only reference titles are included. 2 pts.	References are not included. 1 pt.
	<u>Presentation</u>	Your presentation was outstanding, creative, interesting. Your explanations showed evidence of a thorough understanding of the topic and teaching applications. 16 pts.	Your presentation followed the guidelines, and showed that you had an understanding of most aspects of the topic and teaching applications. 11 pts.	You followed a few of the guidelines for presentations. There was some evidence of planning and practice You had a limited understanding of the topic. 5pts.	You did not do a presentation. 0 pts.

APPENDIX D: RUBRIC FOR SCIENCE INSTRUCTION CASE STUDY

Name: _____

Score Criteria Quality of Work

_____	<u>Classroom Observations</u>	All questions are followed by <u>specific observations</u> . Two or more observations are made and referred to for each question. 15 pts.	All questions are followed by very brief answers. Two or more observations are made and referred to for each question, but they are vague. 10 pts.	All questions are followed by answers. One observation is made and referred to. Observations are not very specific. 5 pts.	Few questions are followed by answers. Observations are not very specific. 0 pt.
_____	<u>Student Surveys</u>	Six student responses follow each question. 15 pts.	Student responses don't follow questions. 10 pts.	Less than six surveys are included. 5 pts.	No student surveys are included. 0 pt.
_____	<u>Teacher Interview</u>	Interviewed teacher in person. All questions are followed by the specific and detailed teacher responses. 15 pts.	Interviewed teacher in person. Some teacher responses are detailed and specific. 10 pts.	Not clear if the teacher was interviewed. Some questions are followed by the teacher's responses. 5 pts.	Teacher does not seem to have been interviewed. Missing teacher responses. 0 pt.
_____	<u>Comparison Chart</u>	Organized data on a grid depicting answers to all grid questions from your observations, teacher interview and student surveys. 15 pts.	Organized data on a grid, but data is incomplete. Not all grid questions were addressed. 10 pts.	A grid was used, but has little information and does not show the results of the observations, interview, and surveys. 5 pts.	Did not use a grid to organize data from your observations, teacher interview and student surveys. 0 pt.
_____	<u>Analysis of Information in the form of a Paper</u>	Analysis of information includes detailed descriptions of matches & mismatches of data. Included recommendation. 2-3 pages. 40 pts.	Brief analysis of information; brief description of matches and mismatches of data. Brief recommendations 1-2 pages. 25 pts.	Incomplete analysis and descriptions of matches and mismatches of data. Minimal recommendations. 10 pts.	Did not analyze information from the 3 sources. Did not include recommendations. 0 pt.