CALIFORNIA STATE UNIVERSITY SAN MARCOS
COLLEGE OF EDUCATION
EDMS 545: Elementary Science Education
Spring 2009
Friday: 8:00 AM – 2:15 PM Bonsall West Elementary
3 Units

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COE 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 on-going service. Our practices demonstrate a commitment to student-centered education, diversity, collaboration, professionalism and shared governance. (adopted by COE Governance Community, October 1997)

Course Prerequisite: Admission to the Multiple Subject Credential Program/CLAD Teacher Credential Program.

COURSE DESCRIPTION

This course focuses on developing an understanding of theory, methodology, and assessment of science in integrated and inclusive elementary classrooms. *This course is aligned with California's SB 2042 Standards*, and it 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.

REQUIRED TEXT & MATERIALS

- Friedl, A.E. & Koontz, T.Y. (2005). *Teaching Science to Children, An Inquiry Approach, 6th Ed.* NY: McGraw-Hill.
- *Science Framework for California Public Schools.* (2003). Sacramento: California Dept. of Education. Also available online.
- 1 Large Blue Book (Course text, Science Framework, and Large Blue Books are available at CSUSM bookstore)
- 1 Laboratory Composition Book
- TaskStream account

Other handouts and resources will be distributed in class or through WebCT

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 of the Learning Cycle model of instruction to teach science in a contemporary manner.
6 Use of 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 learning of science concepts and processes.

9. Design of an elementary science teaching year-long 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

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.

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)

Technology
This course infuses technology competencies to prepare candidates to use technologies, emphasizing their use in both teaching practice and student learning. Students are expected to demonstrate competency in the use of various forms of technology (i.e. word processing, electronic mail, WebCT 6, use of the Internet, and/or multimedia presentations). Specific requirements for course assignments with regard to technology are at the discretion of the instructor. Most assignments will be submitted in hard copy to the instructor, and some specific assignments will also be submitted on WebCT. Keep a digital copy of all assignments for use in your teaching portfolio.

You must use your WebCT email account for this class. The best way to contact me is by WebCT e-mail.

STUDENT LEARNING OUTCOMES

Teacher Performance Expectation (TPE) Competencies

The course objectives, assignments, and assessments have been aligned with the CTC standards for the Multiple Subject Credential. This course is designed to help teachers seeking a California teaching credential to develop the skills, knowledge, and attitudes necessary to assist schools and district in implementing effective programs for all students. The successful candidate will be able to merge theory and practice in order to realize a comprehensive and extensive educational program for all students.

California Teacher Performance Assessment (CalTPA)

Beginning July 1, 2008 all California credential candidates must successfully complete a state-approved system of teacher performance assessment (TPA), to be embedded in the credential program of preparation. At CSUSM this assessment system is called the CalTPA or the TPA for short.

To assist your successful completion of the TPA, a series of informational seminars are offered over the course of the program. TPA related questions and logistical concerns are to be addressed during the seminars. Your attendance to TPA seminars will greatly contribute to your success on the assessment.

Additionally, COE classes use common pedagogical language, lesson plans (lesson designs), and unit plans (unit designs) in order to support and ensure your success on the TPA and more importantly, in your credential program.

The CalTPA Candidate Handbook, TPA seminar schedule, and other TPA support materials can be found on the COE website provided at the website provided: http://www.csusm.edu/coe/CalTPA/ProgramMaterialsTPA.html

COURSE POLICIES

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 are absent 1 class session, your highest possible grade is a "B". If you are absent more than one class session, your highest possible grade is a "C+". Late arrivals and early departures** will lower your course grade. For every two times that you are late and/or leave early, your course grade will be lowered by one letter grade. If you have an emergency, or very extenuating circumstances, please see the instructor to make arrangements accordingly. Absences do not change assignment due dates. If you find that you cannot attend class due to an emergency or very extenuating circumstances, email any due assignments by the start of the class session it is due. NOTE: With few exceptions, late assignments will not be accepted.

Writing Requirement

In keeping with the All-University Writing Requirement, all 3-unit courses must have a writing component of at least 2,500 words (approximately 10 pages), which can be administered in a variety of ways. Writing requirements for this course will be met as described in the assignments.

Computer Use During Class Sessions

You are welcome to use a laptop computer in class when working on class assignments, for example. However, you will need to save checking email or other personal computer use for time outside of class. Most students find it disruptive when they are focusing on class activities or listening to presentations and can hear keyboarding in the classroom. Your kind consideration is greatly appreciated by all!

Electronic Communication Protocol:

Electronic correspondence is a part of your professional interactions. If you need to contact the instructor, e-mail is often the easiest way to do so. It is my intention to respond to all received e-mails in a timely manner. Please be reminded that e-mail and on-line discussions are a very specific form of communication, with their own nuances and etiquette. For instance, electronic messages sent in all upper case (or lower case) letters, major typos, or slang, often communicate more than the sender originally intended. With that said, please be mindful of all e-mail and on-line discussion messages you send to your colleagues, to faculty members in the College of Education, or to persons within the greater educational community. All electronic messages should be crafted with professionalism and care.

Things to consider:

- Would I say in person what this electronic message specifically says?
- How could this message be misconstrued?
- Does this message represent my highest self?
- Am I sending this electronic message to avoid a face-to-face conversation?

In addition, if there is ever a concern with an electronic message sent to you, please talk with the author in person in order to correct any confusion.

Person-First Language

Use "person-first" language in all written and oral assignments and discussions (e.g., "student with autism" rather than "autistic student"). Disabilities are not persons and they do not define persons, so do not replace person-nouns with disability-nouns. Further, emphasize the person, not the disability, by putting the person-noun first.

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.

CSUSM Academic Honesty Policy

"Students will be expected to adhere to standards of academic honesty and integrity, as outlined in the Student Academic Honesty Policy in the CSUSM University Catalog. All written work and oral assignments must be original work. All ideas/materials that are borrowed from other sources must have appropriate references to the original sources. Any quoted material should give credit to the source and be punctuated with quotation marks.

Students are responsible for honest completion of their work including examinations. There will be no tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty in accordance with the general rules and regulations of the university. Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a whole." In addition, all incidents of academic dishonesty will be reported to the Dean of Students.

Plagiarism

It is expected that each student will do his/her own work, and contribute equally to group projects and processes. Plagiarism or cheating is unacceptable under any circumstances. If you are in doubt about whether your work is paraphrased or plagiarized, see the Plagiarism Prevention for Students website http://library.csusm.edu/plagiarism/index.html. If there are questions about academic honesty, please consult the University catalog.

COURSE TOPICS OUTLINE

The Nature of Science
The Learning Cycle Model of Teaching
Learning Cycle Science Lesson Demonstrations
Writing Objectives for Student Learning
Developing Essential Questions
Writing Science Concept Definitions
CA Science Content Standards Grades K-8
California Science Framework
SDAIE Strategies in Science: Teaching Science to English Learners
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
Concept Mapping
Benchmarks and the National Science Education Standards

COURSE REQUIREMENTS/ASSIGNMENTS

Each written assignment is expected to have a clear organizational presentation and be free of grammar, punctuation and spelling errors. There will be a reduction in points for the above mentioned errors. Late assignments are not accepted. Prepare carefully for class, and be ready to discuss readings and assignments thoughtfully. Note the Description of Exemplary Students at the end of this syllabus.

1. Active Participation and Collaboration (all or nothing credit given)	5%
2. Concept Maps (2) - Individual	5%
3. California Science Framework and Standards Task and Presentation - Indiv. & Grp	10%
4. Learning Cycle Hands-on Science Lesson Design & Presentation - Group	20%
5. Hands-On Learning Cycle Lesson Reflections - Individual	10%
6. Science Fair Exploratorium Lesson and Presentation – Group	15%
7. Learning Cycle Lesson Drawings and Explanations (5% each part) - Individual	10%
8. Science Curriculum Unit Plan and Presentation - Individual	25%

NOTE*:* Each student is responsible for ensuring that assignments are submitted correctly and on time. All assignments will be submitted in hard copy at the start of class (per course schedule), and some specific assignments will also be submitted electronically to WebCT as class resources. Keep a digital copy of all assignments for your credential program electronic portfolio.

DESCRIPTIONS OF ASSIGNMENTS

1. Active Participation and Collaboration - 5% (all or nothing credit)

Teacher education is a professional preparation program and students will be expected to adhere to standards of dependability, professionalism, and academic honesty (refer to rubric attached to this syllabus).
Grading will include a component of "professional demeanor." Students will conduct themselves in ways that are generally expected of those who are entering the education profession, including the following:

- On-time arrival to all class sessions and attendance for the entire class period
- Advance preparation of readings and timely submission of assignments
- A positive attitude at all times
- Active participation in all class discussions and activities
- Respectful interactions and courteous language with the instructor and other students in all settings
- Carefully considered, culturally aware approaches to solution-finding

Class Discussions and Participation: Students will engage in active learning each class session, and will be expected to actively participate. You may loose points for lack of participation based on the following criteria:

- 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?

2. Concept Maps (Individual) - 5%

Each class session, you will be required to complete the assigned readings according to the Course Schedule located in this syllabus. You should read the chapters to develop an indepth understanding of the science content. The assigned readings provide an important foundation for your increasing understanding of both science content and how to effectively teach science. To further aid you in remembering the readings and assist you with meaningful class participation, you are asked to respond to the reading assignments with concept maps. **You will be required to complete two (2) Concept Maps during the course (based on your choice of which two chapters from the assigned readings listed in the Course Schedule)**.

Concept maps will be due at the beginning of class time on the assigned dates. You will only receive credit points if concept maps are completed by the start of class on date indicated in the course schedule. You must use a Big Blue Book for both Concept Maps. Spiral paper inserted in Blue Books will not be accepted.

Both Concept Maps should include ALL major concepts discussed in **one** chapter. Do not include information from the investigations, only the science content. The Concept Map must follow the Concept Mapping procedures taught in class. All concepts should be enclosed in an oval, with linking verbs connecting at least two ovals in a hierarchical manner.

Each concept map has a possible total of 9 points:

a. Most general, inclusive Concept at top…….....1 point
b. Map clearly demonstrates hierarchy or relationships……2 point
c. ALL major concepts included…….. 3 points
d. 1-2 words (nouns) for Concepts…….....2 points
e. Verbs or prepositions for linking words between concepts…….. .2 points

For each Concept Map, (a) indicate on each page of your Large Blue Book the title of the Chapter you are outlining, and (b) write your name and date at the top of each page

3. California Science Framework and Standards Activity - 10%

Purpose of the assignment: To read a portion of the California Science Framework and the Standards for an assigned grade level. You will write your individual response to the readings. Then you will work with your partner to prepare and do a presentation to the class. It is essential for you to do the reading and the write-ups BEFORE you meet with your partner.

3a. Task I: Framework summary response: (Individual) – 5 pts

- Read the first part of the California Science Framework, up to page 22. This includes Board Policy, the Introduction and Chapters One and Two.
- Think about the reading holistically.
- Type about a page, in your own words, that answers these questions: What were the most important ideas addressed in the reading? How does science teaching differ from instruction in other subjects? What are the most important elements of a strong science instructional program?
  Come to the next class session (#2) prepared to discuss the questions and turn in your answers.

3b. Task II: Grade level Science standard response: (Individual) – 10 pts

Using the standard for your chosen grade, pick a line item from physical science, life science, and earth science. For each one, come up with a brief description of an activity that children in that grade can do that also addresses one of the Investigation and Experimentation standards for the grade. You should end up with three sections, each of which includes a content line (physical, life, or earth science), an Investigation and Experimentation line, and a one or two sentence description of an activity that combines the two. The whole thing should be about a page. See an example on the next page. Due date: class session 2.

3c. Task III: Team preparation and presentation – (In class with your team) – 10 pts

You will be given 30-40 minutes of class time to work with your partner.

Get together with your team. Look at the activities that you both wrote up for Activity 3b (Task II). Choose one activity.

- As a team, write up a lesson plan for the activity (with a lesson title, science content and Investigation and Experimentation standards, learning objectives, an assessment plan, and a brief description of the activity). Neatly put it on chart paper so it can be easily presented to the class. Make sure you quote the standards on which your lesson plan is based.
- As a team, come up with a brief overview of the Science Standards for your grade. Don't try to give us every single line of the standard. Summarize it in such a way that we see generally what students are supposed to learn in physical, earth, and life science and in investigation and experimentation in that grade. On chart paper, list the competencies indicated in the Science Standards for your grade
- In 8 minutes or less, present your lesson plan sketch and standards overview to the class. Be prepared to explain why your lesson plan represents really good science for kids.
- Your grade for this assignment will be based on the content and quality of your presentation, and on the level of collaboration with your team.

Sample Response to Assignment 3b.

Grade Four

Physical Science
1b. Students know how to build a simple compass and use it to detect magnetic effects, including the Earth's magnetic field

Investigation and Experimentation
6f. Follow a set of written instructions for a scientific investigation.

Activity
Following directions from the Internet, the students will work in partner pairs to build compasses, using paper cups, thread, a needle and a magnet. They will observe and record the action of the compass indoors and outdoors, and in proximity to various objects.

Life Science
2c. Students know decomposers; including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.

Investigation and Experimentation

6c. Formulate and justify predictions based on cause-and-effect relationships.

Activity
The students will predict the growth of mold on bread that has no preservatives. They will observe and record the progress of the mold in various circumstances (if the bread is left in the open air, if the bread is in a closed sandwich bag, etc.)

Earth Science
5c. Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Investigation and Experimentation
6b. Measure and estimate the weight, length, or volume of objects.

Activity
In groups of four, students will create landforms (using common dirt) on cookie sheets. They will add measured amounts of water to their landforms, and will collect and measure the dirt that runs off.

4. Learning Cycle Hands-on Science Lesson Design & Presentation - 20%
(Due on assigned day for the lesson per course schedule)

Purpose: To develop and teach a particular kind of a science inquiry lesson that teaches both science thought processes and science content.

Students will lead hands-on science lessons during class. The lessons should (a) model inquiry teaching and learning (b) be based on strong essential questions, (c) be content-understandable, and (d) be based on the CA Science Content Standards. Differentiated strategies for English language learners, students with special needs and GATE students as well as technology integration are required components of this assignment.

You will work in groups of two or three (group sizes TBD based on class size) to lead a science lesson based on the Learning Cycle Model of Instruction. You will prepare and teach this lesson to your classmates. Each team will be assigned a specific science topic for which you will plan and teach the lesson. This topic will determine the grade level and California Science Standard your team lesson design will cover. Use activities from the textbook, Internet sites or other science resources. The team should teach the lesson as you would to elementary school students. 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. Each team will be allocated a maximum of 35 minutes of class time to teach their lesson.

The lessons should follow the **Learning Cycle** Instructional Model (make sure that you include all **3 stages**), must include hands-on activities, and should emphasize specific science concepts. The Exploration and Application phases of the Learning Cycle require different hands-on science activities using manipulatives. Before the lesson, write the essential questions about the lesson on the board for students to consider during the lesson. These questions should be **higher level questions** (analysis, synthesis or evaluation level) according to Bloom's Taxonomy.

Begin Exploration with students making predictions/answering questions or accomplishing challenges. 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 need to know and demonstrate the stages of the Learning Cycle, or you will not be given credit for your lesson.**

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. Your lesson plan should also identify and explain strategies for English language learners and adaptations for both students with special needs and for GATE students.

Prepare a PowerPoint Presentation to use in your lesson that is a strong overview of all your lesson design components. Include: Lesson title, grade level, content area and subject matter, state science standards, objectives, definitions of important science concepts in the lesson, essential questions, learning cycle phases, a briefly detailed explanation of the science content, assessment plan and criteria, accommodations/adaptations for ELs, GATE, SPED, and 3 everyday applications. Additionally, include a list of at least 3 interactive 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. **Bring children's literature reflecting science concepts relating to your lesson topic to showcase.**

Science Lesson Plan Document

- Prepare a comprehensive document that includes the information under Lesson Design Format (see pages 9-12 of this syllabus), making sure you include:
    - Your names at the top
    - All components in the Lesson Design Format
    - References and other required information at the end of the lesson plan.

IMPORTANT NOTE: At least three full days PRIOR to your presentation, email your complete lesson design and your PowerPoint Presentation to me for review. Include all team members' names and the date you will present to the class in the email. After I email you back regarding needed changes and you make revisions, please post your

revised lesson design and PPT on the appropriate thread in the WebCT discussion board for access by your classmates.

On the day of your lesson presentation, please begin the lesson by turning in 1 hard copy of your lesson design and data sheets to me. You should also give me copies for each team member of the Lesson Design Rubric available in the Handouts and Readings folder of your WebCT homepage.

Science Lesson Design Format

Elements of the learning experience

Lesson Title: What is the title of your lesson?

Grade Level:

Content Area: *Example: Life Science, Physical Science or Earth Science*

Subject Matter: *Example: Heat Transfer, Plant Reproduction, The Digestive System, etc*

Time period for the learning experience *Example: two 60 minute sessions Science*

Student Groupings: How will you group students for instruction?

State adopted science content standards: Include at least 1 science area (life science, physical science, or earth science) standard and 1 Investigation/Experimentation standard.

Lesson objective(s) (based on the content standards): What do you want students to be able to do? Write in complete sentences. Use an action verb and explain how students will demonstrate their new knowledge and understanding. *Example:* "The student will demonstrate understanding of _____." Or, "The student will be able to _____"

Science Concept(s): What Big Idea(s) are you trying to teach? Do not say "The students will ____." (That is an objective, not a concept.)
Example: Electricity is a form of energy generated by the flow of electrons through a conducting substance.

Essential Questions: List at least two essential questions specific to the concept that you want students to be able answer during the lesson. What is it that students should be able to answer by having successfully participated in your lesson? These are based on the BIG Ideas (tied to the learning objectives) of your lesson to focus student learning and should be high order questions.

Examples: How does sound travel? (Also: Explain how sound travels.)
How is frequency related to the volume of a sound?
How can you prove that air is a real substance that occupies space?

Class Description - For the purpose of this assignment, the class description must include English Language Learners, Special Education Students and GATE students

Type of class (self contained, subject specific), time of year, general background of students learning in relationship to new learning (challenges and prior learning)

English Learner: Beginning, intermediate, and advanced (use the ELD standards to determine the needs of each of these students).

Special education: one student with a learning disability(ies) and one with another special education identified disability

GATE student: identify the student's needs

Regular education: remaining students

Developmental needs of the students at this age

Example: Give examples based on the different learning needs for K-3 and 4-6 students

Example: Developmental age-appropriate skills and needs of the students
Example: Engaging activities (hands on, etc)

Assessment Plan

Note: Goals/objectives assessed are based on the content standards and are tied to the Big Ideas in Your lesson.

Types of assessment: Prior knowledge (pre assessment), Formative (progress monitoring), Summative (final product)

Description and Purpose of the Assessment:

Feedback strategies: How students will be informed of specific successes and challenges and future activities to fill the individual student's gaps.

Description and Purpose of Differentiated/Adapted Assessment Methods for:

- *English Learners*
- *Learners with Special Needs*
  - *Learning Disability*
  - *Physical Disability*
- *GATE Students/Advanced Learners/Accelerated Learners*

How assessment results will be used to inform instruction:

Assessment Criteria

What criteria will you use to grade the assessment? How will you know if a student has successfully completed the assessment and accomplished the learning goals? What will they do to show you they have succeeded?

Materials/Resources

What will the teacher need? What will the students need?
Review teacher's manuals, pacing guides, and appropriate supplemental materials to determine the materials you will need to present this lesson. Materials should include lists of supplies that will be needed to present this lesson.

Instructional Strategies/Lesson Procedures

Explain the procedures for each phase of the Learning Cycle. Include what the teacher will do and what the students will do. Address the subject matter learning goals and developmental needs of the students described. Include suggested number of minutes for each component of the lesson.

The Learning Cycle* **	**INSTRUCTIONAL STRATEGIES** *Instructional strategies are what the teacher does during the instruction. Put one instructional strategy in each box with an explanation and amount of time you are anticipating. Expand the number of boxes to match each strategy.*	**STUDENT ACTIVITIES** *Put one student activity to match the instructional strategy in each box with an explanation and amount of time you are anticipating. Expand the number of boxes to match each student activity.*
Engagement	How will you focus/motivate students? ___ mins	What will students be doing during the anticipatory set? ___mins
Exploration	Explain what and how you will provide an exploration science activity (must be hands-on). ___ mins	Explain what students will be doing during the exploration activity. ___ mins
Concept Invention a. Students share what they did and learned during Exploration b. Teacher introduces students to new information.	How will you have students share their ideas, knowledge and questions from the exploration phase? Explain how you will introduce students to relevant information, terminology and concepts to reinforce what they learned during exploration. ____ mins	Explain how students will share their ideas, knowledge and questions from exploration phase. Explain what students will be doing while you are introducing relevant information, terminology and concepts to reinforce what they learned during exploration. ____mins
Concept Application	Concept Application- Explain what and how you will provide a second hands-on science activity that extends students' thinking and learning from the two previous two phases? ____mins	Explain what students will be doing during the concept application activity. ____mins

*****Reminder: Use the Learning Cycle model of instruction for the instructional strategies and student activities:**

a. Exploration (Begin with students making predictions; then have a hands-on SCIENCE activity.)
b. Concept Invention (Make sure students share and discuss data and ideas in the first part of this stage; then teacher introduces new terms and provides further explanations.)
c. Concept Application (Should be a 2nd hands-on SCIENCE activity.)

Differentiated Instruction

Differentiated instruction based on the learning goals and instructional strategies for English Learners

TASKS	Beginning EL	Intermediate EL	Advanced EL
Identify 1 instructional strategy or student activity from the plans that could be challenging for the student considering the description of your student.			
Describe how you would adapt the strategy or activity to meet the learning needs of the student considering subject matter pedagogy in your description.			
Explain how your adaptation would be effective for the student in making progress toward achieving the learning goals of your lesson.			

Differentiated instruction based on the learning goals and instructional strategies for Special Education

TASKS	LEARNING DISABILITY	PHYSICAL DISABILITY
Identify 1 instructional strategy or student activity from the plans that could be challenging for the student considering the description of your student.		
Describe how you would adapt the strategy or activity to meet the learning needs of the student considering subject matter pedagogy in your description.		
Explain how your adaptation would be effective for the student in making progress toward achieving the learning goals of your lesson.		

Differentiated instruction based on the learning goals and instructional strategies for GATE students

TASKS	Describe GATE student's needs:
Identify one instructional strategy or student activity from the plans that could be challenging for the student considering the description of your student.	
Describe how you would adapt the strategy or activity to meet the learning needs of the student considering subject matter pedagogy in your description.	
Explain how your adaptation would be effective for helping the student in making progress going beyond the learning goals of your lesson.	

Also include at the end of the Lesson Design document:
Science Content Background: 1-2 pgs minimum summary of the content background
Web Sites: At least 3 interactive relevant web sites with descriptions
Three (3) Applications to everyday life and explanations
Two (2) examples of children's literature on your science topic- BRING BOOKS TO CLASS
References: Title, author, publisher, year

For your lesson plan presentation:
Your group should be prepared to present a strong overview of your lesson plan using PowerPoint (PPT) in addition to presenting your lesson to your cohorts. For an exemplar of what elements your PPT should contain, a model will be provided on the "PowerPoint Presentations" folder on the home page of WebCT (refer to page 9 of this syllabus for what your PPT should contain.

5. REFLECTIONS: Due the Class Session after Your Lesson Presentation – 10% total (10 pts each)

A. Reflection on the Instructional Strategies of the Hands-on Learning Cycle Lesson Design: 5%

After teaching the lesson in class to your cohorts, each team member should write an individual reflection (and turn it in at the next class session) addressing the following prompts:

Why were the instructional strategies, student activities, and resources appropriate for this class based on content and student development?

How did they address the developmental needs of these students?

How did they help the students make progress toward achieving the state adopted academic content standards for students in this content area?

How were students able to understand & make connections between lesson content and the outside world?

What are strengths and weaknesses in your instructional strategies, student activities and resources?

What are possible recommendations for improvement?

B. Reflection on the Assessment Methods of the Hands-on Learning Cycle Lesson Design*: 5%*

After teaching the lesson in class to your cohorts, <u>each</u> team member should write an individual reflection (and turn it in at the next class session) addressing the following prompts:

1. *Strengths and weaknesses in your general assessment methods: Prior knowledge (pre assessment) Formative (progress monitoring), Summative (final product)*

2. *Strengths and weaknesses in your differentiated/adapted assessment methods: English Learners, Special Needs, GATE Students/Advanced Learners/Accelerated Learners*

3. *Describe an alternative assessment based on the potential gaps in the students' learning.*

All discussion points should be related to the learning goal(s/objectives) and Big Ideas in your lesson

6. <u>Science Exploratorium Lesson Plan & Presentation</u> <u>(in pairs) – **15%**</u>

Develop an inquiry activity that uses a discrepant event appropriate for elementary students. You will work in groups as assigned in class.

You will prepare a hands-on science lesson and poster about a discrepant event that leads to a science concept. You will present the lesson at an Elementary School Science Fair Exploratorium. The audience will be K-6 grade students at an elementary school to be identified later in the semester. 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 activity should include hands-on tasks and should emphasize particular science concepts. The activity should allow students to explore, and then you will explain the concept behind the activity. Make sure you have a concept application activity(different than that used in the exploration activity) in case there is time available for students.

On the day of the fair, you will do the activity repeatedly (about 10 times) to teams of about 7 students.

<u>Type up an abbreviated group Lesson Plan (due a week before the Science Fair Exploratorium)</u> with your names at the top and REFERENCES at the end of the lesson plan.

1. Lesson title – Create a "catchy" title that will attract and motivate students to engage in your activities.
2. Grade level
3. Content Area & Subject Matter
4. 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.)
5. Essential Questions (ensure high order questions!)
6. 1-3 Learning (Behavioral) Objectives: The student will be able to _____ or, The SWDUO_____
7. California Science Content Standards addressed (both science content and I/E standards)
8. Materials and Resources (what the teacher needs; what the students need)
9. Exploration Activity
10. Concept Invention
11. Concept Application Activity
12. The Reflection (individual work and <u>due the following class session</u>) answering the following questions:
    a. How did the children respond? (What did they say and do?)

a. How do the children's actions and responses demonstrate their level of understanding?
b. How did you (or can you) improve upon your lesson to facilitate understanding?

7. Learning Cycle Lesson Drawings and Explanations (individual) **- 10% total**

LC Lesson Drawings – 5%

In your Lab Book—Reserve the first 2 pages in your Lab Book for a **Title Page** and for a **Table of Contents**. After a given Learning Cycle presentation, you will make drawings (at least one per lesson) illustrating what you learned during the lesson. Number each drawing for each lesson (Drawing #1, #2, #3, etc.). **At the top of each page, write the date and title and number of the drawing**. **Label each of your drawings legibly and clearly indicate the title of the lesson**. Be sure to pay attention during the lesson so that you have something to draw and a given drawing illustrates your understanding of the lesson. You must **legibly label** parts of drawings. **Drawings should illustrate the major science concepts** that students were supposed to learn.

Each drawing will count 5 points towards your L.C. Lesson Drawings grade.
Drawings will be assessed based on the following criteria:

- **Does the Drawing illustrate the major science concepts taught in the lesson?**
- **Does the Drawing include legible labels?**
- **Does the Drawing make "sense"? Can one look at it and understand what was taught?**

You must have at least a total of 10 drawings in your lab book. We will have more than 10 Learning Cycle Lessons; you are to choose at least 10 from among these.

LC Lesson Explanations – 5%

In your Lab Book--On the page immediately following each Drawing for a chosen Learning Cycle lesson presentation, you will write an explanation of the science concepts taught—about ½-1 page in length. Number each Explanation (Explanation #1, #2, #3, etc.). **At the top of each page, write the date, title and number of the Explanation. Label the Explanation with the title of the lesson**. Be sure to pay attention during the lesson so that you have something to explain! Each explanation should be a complete description of the major science concepts that students were to learn during the lesson.

Each explanation will count 5 points towards your L.C. Lesson Explanations grade.
Explanations will be assessed based on the following criteria:

- **Does the Explanation describe the major science concepts taught in the lesson?**
- **Does the Explanation make "sense"? Can one read it and understand what was taught?**
- **Is each Explanation on a separate page from the drawings and the other explanations?**

You must have a total of at least 10 explanations that correspond to the 10 drawings (at the very least) in your lab book. We will have more than 10 Learning Cycle Lessons; you are to choose 10 from among these for both drawings and explanations.

8. Science Curriculum Unit (Teams of 4; each group member writes 1 unit) - **25%**

The goal of this assignment is for you to develop year-long plans for instruction in science based on the California Science Content Standards, as well as develop skills for teaching in the elementary grades. For this assignment, you will plan a year of science instruction for one grade level, based on the California Science Content Standards. You will divide the Science Content Standards for one grade level into four units (you may possibly determine that your grade level standards could be divided into five or six units as well). For each unit that is developed, you will use the science standards (and their descriptions in the Science Framework) to design enduring understandings, unit learning objectives, end-of-unit assessments, and a rubric to use in grading the assessments. For the final

part of this assignment, you will develop ideas for three learning cycle lessons for each unit, based on the Science Standards, Enduring Understandings, Unit Learning Objectives and Final Assessments in the units. You will work in a group of four—one person will create one unit from each of the four (or more) total units your group decides on as comprising the year-long plan.

When you complete this assignment, you will have a curriculum plan for teaching the science standards, units and lessons for teaching science for a full year for one grade level. We will share these, so that everyone leaves with curriculum plans, units and lessons for a full year of teaching science at all grade levels. You may share these with your cooperating teachers and use them in your clinical practice.

Science Curriculum Unit (Created by each Unit Team member)

Each Unit:

I. Unit Title: _____

II. Grade Level:

III. Unit Timeline in weeks _____

Highly Suggested: Make a list of all the BIG IDEAS that are contained in your unit and which will form the basis of unit learning objectives.

IV. Standards

Content (Physical, Life, Earth Science) Standards
Investigation and Experimentation Standards

V. Enduring Understandings (info and processes you hope students remember and understand next year)

VI. Unit Learning Objectives (tells what students can DO after instruction). Use "Students will demonstrate understanding of_____." OR "Students will be able to _____ (use action verbs here)."

VII. Final Summative Assessment Plan – End of unit assessment over the whole unit, all unit standards, & all unit learning objectives.

a. Type of assessment given, description of each type of assessment given, and how each will be conducted.
b. Reasons/purpose for each type of assessment given.
c. Feedback strategies: How students will be informed of specific successes and challenges?

Note! Your assessment plan discussion should reflect ALL your Unit Learning Objectives (which should be based on the state science standards)

VIII. Assessment Criteria

What criteria will you use to grade the assessments? How will you know if a student has successfully completed the assessments and accomplished the learning goals? What will they do to show you they have succeeded?

Note! Your assessment criteria should be tied to and reflect ALL your Unit Learning Objectives (which should be based on the state science standards). These should mirror your discussion in VII.

IX. Rubric Listing Criteria that you will use in the Final Assessment Plan

The final assessment plan over the Unit includes a rubric listing the criteria that you will use in determining the degree of student learning. This rubric should reflect the assessment criteria you listed in VIII above. See rubric exemplar below.

Rubric over Final Assessment (with Criteria Exemplars)

Criteria	Exceeds Expectations	Meets Expectations	Below Expectations	Points & Comments
Demonstrates Understanding of the Assigned Ecosystem				
Demonstrates Understanding of Food Chains Within the Assigned Ecosystem				
Demonstrates Understanding of General Food Web Components				
Demonstrates Understanding of Energy Sources and Flow within a Food Web				
Student-Created Food Web Poster Reflecting Assigned Ecosystem				
Oral Report on Student-Created Food Web Poster				
Student-Created Assigned Ecosystem Diorama/Model				
WebQuest Project on Assigned Ecosystem				

X. Ideas for 3 Lessons for your Science Unit - Each lesson should include the following:

Lesson # (1, 2 or 3):

Grade Level:

Lesson Title: *Example: Energy Sources in an Ecosystem*

Content Area: *Example:* Life Science

Subject Matter: *Example: Ecosystems*

Time Period for the Learning Experience: *Example: two 60-minute sessions*

State Science Standards: What standards are addressed? Include at least 1 science area (life science, physical science, or earth science) standard and 1 investigation/experimentation standard.

Learning Goals based on the Content Standards.? What do you want students to be able to do? Write in complete sentences. Use an action verb and explain how students will demonstrate their new knowledge and understanding. "The students will _____." or The students will demonstrate understanding of_____."

Science Concept(s): *Example*: A food web is a complex network of many interconnected food chains and feeding relationships in an ecological community by which energy and nutrients are transferred from one species to another.

Essential Question(s) (higher level; see Bloom's taxonomy) - What leads to the big idea? (be sure these are not lower level fact or info. questions) *Example: Explain the relationship between biomes and ecosystems.*

Overview of Learning Cycle Procedures: Ideas for:

a. Exploration (3-4 lines)
   (Begin with students making predictions; then have a hands-on SCIENCE activity.)

b. Concept Invention (3-4 lines)
   (Make sure students share and discuss data and ideas in the first part of this stage; then teacher introduces new terms and provides further explanations.)

c. Concept Application (3-4 lines)
   (Should be a 2nd hands-on SCIENCE activity.)

RESOURCES LIST THAT CAN HELP IN YOUR LEARNING OF SCIENCE CONTENT AND METHODS

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

EDMS 545 Tentative Course Schedule: Spring 2009 (Friday)

Date	Course Topics & Activities	Readings & Work Due
Session 1 1/23/09	~ Community Building ~ Course Overview/Syllabus Review ~ **The Nature of Science** ~ **Inquiry Processes in Science** How do we make decisions about what to teach and the best strategies/processes to teach it? ~ Science process skills and scientific attitudes ~ **CA Science Content Standards & Frameworks:** What themes do we use as a framework to decide what science students should learn? ~ Intro: **The Learning Cycle Model of Instruction** ~ Framework & Standards groups formation ~ **Hands-on Learning Cycle Science Lesson Plan groups sign- ups** ~ A Private Universe (tentative) ~ **Assign Framework and Standards Task I, II, III**	**Bring course syllabus to class** **Bring course text to class** - Read Chapters 1 and 2, 3 of *Teaching Science to Children* as a framework for course concepts & skills - Bring Science Content Standards (K-8) to all classes. - Read CA Science Framework: pgs 1-22 for Framework & Standards: Task I due next week. - **Read Learning Cycle Handout on WebCT and bring a copy to next class** - Access learning cycle info on "Weblinks" (WebCT)
Session 2 1/30/09	~ Overarching themes students should learn in science: **Big ideas in Science Teaching & Learning** ~ Using **The Learning Cycle** to teach science as inquiry: Focus on sequencing instruction to support learning outcomes What teaching strategies ensure participation of ALL students? ~ Instructor-led learning cycle lesson ~ Writing **Essential Questions** ~ **Writing learning objectives to support assessment in science** ~ Hands-on Learning Cycle Lesson Plan group formation (if not done in session 1) ~ **Concept maps and science content** ~ **Complete work on Framework & Standards Task III (with team)**	- Bring Science Content Standards (K-8) to all classes. - Read Chapter 4, 5 or 6 of *Teaching Science to Children* **DUE: Framework and Standards Task I (individual)** **Due: Framework and Standards Task II (Individual). Post to WebCT** **Framework and Standards Task III & presentations due (team). Post to WebCT – (one posting per team)** **View Disability Video** http://www.washington.edu/doit/Video/winequ.html
Session 3 2/06/09	Making Science Content Accessible to ALL students ~ What are the best indicators that students have learned and understood the intended outcomes? ~ Adapting science curriculum for children with special needs ~ Activities and strategies to ensure participation of ALL students ~ Focus on Assessment: Authentic assessments ~ Instructor-led learning cycle lesson **LESSON DESIGN** ~ Group Learning Tasks: In-class work on Lesson Design using hands-on Learning Cycle Model (HOLC) ~ Science kits ~ Formation of Year-Long Curriculum Plan groups ~ National Science Education Standards	- Read Chapter 7, 8 or 9 of *Teaching Science to Children* - ****Concept Map due in BBB on one of: Ch 7, 8 or 9**

Session 4 2/13/09	~ Teaching Science to English Learners ~ Intro: Developing Science WebQuests & Technology ~ Instructor-led learning cycle lesson ~ Safety guidelines for the science classroom ~ **Developing and Planning Year-Long Science Curriculum: Planning Units of Instruction**	- Read Chapter 10, 11, or 12 of *Teaching Science to Children* - ****Concept Map Due In BBB on one of: Ch. 10, 11, or 12** - *****Learning Cycle Lesson Presentations: Teams 1, 2, 3, & 4. Post to WebCT—one posting per team.**
Session 5 2/20/09	~ Integrating writing into science activities ~ Instructor-led learning cycle lesson ~ **In-class work on Year Long Curriculum Plans: Science Units** ~ **Science Fairs/Exploratorium and the Inquiry Model**	- Read Chapter 14, 15, or 16 of *Teaching Science to Children* - ****Concept Map due in BBB on one of: Ch. 14, 15, or 16** *****Learning Cycle Lesson Presentations: Teams 5, 6, & 7. Post to WebCT--one posting per team.**
Session 6 2/27/09	~ Instructor-led learning cycle lesson ~ In-class work on Year Long Curriculum Plans: Science Units	- Read Chapter 17, 18 or 19 of *Teaching Science to Children* - ****Concept Map due in BBB on one of Ch. 17, 18, or 19** ***** Learning Cycle Lesson Presentations: Teams 8, 9, & 10. Post to WebCT--one posting per team.** **Science Exploratorium LPs due in folders**
Session 7 3/06/09	**~ Tentative: Computer Lab Time** **~ Science Fair Exploratorium Presentations at Alvin Dunn Elementary Tentative Grade level and time TBD**	**Post Science Exploratorium LP to WebCT—one per team** ***** DUE: Learning Cycle Lesson Drawings and Explanations Composition Book**
Session 8 3/13/09	~ Curriculum Plan Sharing/Presentations ~ Course Wrap-Up ~ Course Evaluations	- **Year-Long Science Curriculum Plan (4 Units) Due- Post to WebCT as ONE complete Plan (1 team member posts)**

******** *Choose <u>two</u> Concept Maps to submit according to the assigned dates for text readings chapters in course schedule.*
****BBB = Big Blue Book*

GRADING STANDARDS

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

It is expected that students will proofread and edit all their assignments prior to submission. Students will ensure that the text is error-free (grammar, spelling), and ideas are logically and concisely presented. The assignment's grade will be negatively affected as a result of this oversight. Each assignment will be graded approximately 80% on content and context (detail, logic, synthesis of information, depth of analysis, etc.), and 20% on mechanics. All reference/resource citations should use appropriate citation form. Please consult with the American Psychological Association (APA) format in the APA Manual, 5th edition for citation guidance.

NOTE: You must maintain a B average (3.0 GPA) in your teacher education courses to receive a teaching credential from the State of California. Courses are not accepted if final course grades are below a C+.

Exemplary "A" Students

1. Demonstrate serious commitment to their learning, making full use of the learning opportunities available and searching out the implications of their learning for future use.
2. Complete all assignments thoroughly, thoughtfully and timely.
3. Make insightful connections between assignments and their developing overall understanding of science concepts; continually questioning and examining assumptions in a genuine spirit of inquiry.
4. Attends every class, always timely, and shows high level achievement of course goals.
5. Display a "can do" attitude, give 100%, and works to help others learn too.
6. Contributes a great deal to class environment, showing respect and concern for all members.

"B" Students

1. Completes all assignments, all on time, and demonstrates the ability to summarize, analyze, and/or reflect at fairly high levels, showing consistent improvement over time.
2. Completes all of the reading assignments and develops thoughtful and fairly thorough responses.
3. 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.
4. Develops presentations demonstrating significant learning.
5. Presents confidently and intelligently, demonstrating effective teaching skills.
6. Attends every class meeting and is regularly engaged during class.
7. Contributes to the positive environment of the class by respecting all members.

It is expected that students will proofread and edit all their assignments prior to submission. Students will ensure that the text is error-free (grammar, spelling), and ideas are logically and concisely presented. The assignment's grade will be negatively affected as a result of this oversight. Each assignment will be graded approximately 80% on content and context (detail, logic, synthesis of information, depth of analysis, etc.), and 20% on mechanics. All reference/resource citations should use appropriate citation form. Please consult with the American Psychological Association (APA) format in the APA Manual, 5th edition for citation guidance.