

**CALIFORNIA STATE UNIVERSITY SAN MARCOS  
COLLEGE OF EDUCATION  
EDMS 545B Science Education in Elementary Schools  
Spring 2009 Monday 1:00-3:45 UH460**

**Instructor:** Dr. Ingrid M. Flores  
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**Office Hours:** after each class and by apt. Please call or email to set up a convenient time to meet.  
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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 PREREQUISITES**

Prerequisite Courses, Semesters 1-2 of Integrated Bachelor of Arts and Multiple Subject Credential Program, and consent of Program Coordinator.

#### **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*, 6<sup>th</sup> Ed. NY: McGraw-Hill. ISBN: 0-07-256395-8
- *Science Framework for California Public Schools*. (2003) Sacramento: California Dept. of Education.
- 2 Large Blue Books
- 1 Laboratory Composition Book
- \$1.50 cash for visit to Jack's Pond Nature Center
- 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).

## **COURSE TOPICS**

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

## **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>

## INFUSED COMPETENCES

### **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.

## 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 2 days, your highest possible grade is a B. If you are absent more than 2 days, your highest possible grade is a C**, which means that you will not pass the course. **Late arrivals and early departures** will lower your course grade. For every two times that you are late or leave early, your course grade will be lowered by one letter grade. If you have an emergency or have extenuating circumstances, please see the instructor to make arrangements accordingly. Absences do not change assignment due dates. 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

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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.

As an educator, 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.

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## 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

- A 90-100%: Outstanding work on assignment, excellent syntheses of information and experiences, great insight and application, and excellent writing.
- B 80-89%: Completion of assignment in good form with good syntheses and application of information and experiences; writing is good.
- C 70-79%: Completion of assignment, adequate effort, adequate synthesis of information, and application of information and experiences, writing is adequate.
- D 60-69%: Incomplete assignment, inadequate effort and synthesis of information, writing is less than adequate.

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, 5<sup>th</sup> edition for citation guidance.

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+.

Keep digital copies of all assignments for your Credential Program Electronic Portfolio. You will not be assigned a course grade unless all the assignments are turned in.

## 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.

1. Active Participation and Collaboration (all or nothing credit given)	5%
2. Reading Journal (Concept Maps)	10%
3. California Science Framework and Standards Activity	10%
4. Hands-on Learning Cycle Science Lesson Design and Presentation	20%
5. Learning Cycle Lesson Drawings and Explanations (5% each)	10%
6. Science Exploratorium Lesson Plan/Presentation	15%
7. Science Curriculum Unit and Presentation	25%
8. Course Reflection	5%

## DESCRIPTIONS OF ASSIGNMENTS

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

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 with the instructor and other students in all settings
- Carefully considered, culturally aware approaches to solution-finding

### 2. **Reading Journal (Concept Maps): individual - 10%**

The purpose of the journal entries is to help you carry the science content from short term into long term memory and understanding so that you can more easily teach science when you become a classroom teacher. The assigned readings provide an important foundation for your increasing understanding of how to effectively teach science. You will need a large Blue Book. Reading journals (blue books) will be collected and will only receive full points if completed by the date indicated in the schedule. You must use a Blue Book, and spiral paper stuck in Blue Books will not be accepted.

You will be required to complete 3 Concept Maps for this course. Use your Big Blue Book for these entries. Concept Maps may be done by hand but must be neat and legible. For each Concept Map, choose one different chapter from the text readings indicated in the Course Schedule of Topics and Assignment attached to this syllabus. Concept Maps are to be turned in according to the date assigned to the chapter reading.

- The Concept Map 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.

Each concept map has a possible total of 10 points.

- a. Most general, inclusive Concept at top.....1 point

- b. Map must show structured hierarchy.....2 points
- c. All major concepts included.....3 points
- d. 1-2 words (nouns) for Concepts.....2 points
- e. Verbs or prepositions for Linking Words between Concept..... 2 points
- f. NOT mind-mapping or mind-webbing

For Concept Maps, **(a) indicate on each page of your Large Blue Book the title of the Chapter you are outlining, (b) write your name and date at the top of each page and (c) number 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 a particular grade. 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 that you do the reading and the write-ups BEFORE you meet with your partner.

**3a. Framework summary response: (Individual assignment) – 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 class prepared to discuss the questions and turn in your answers.

**3b. Grade level Science standard response: (Individual) – 5 pts**

- Using the standard for your chosen grade, each one of you will pick a line item from physical science, life science, or earth science (All 3 will be represented within each group of 3 students). 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. Write your name on yours and turn in with your partners'.
- See example next page.

**3c. Team preparation and presentation – (Small group ) – 10 pts**

Get together with your partners. Look at the activities that you each wrote up for Assignment 2b. Choose one activity.

- With your partner, write up a lesson plan for the activity (with standards, objectives, assessment plan, and a brief description of the activity). Put it on chart paper or PowerPoint so it can be easily presented to the class. Make sure you quote the line from the standard on which your lesson plan is based.
- With your partners, 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 an overview of what students are supposed to learn in physical, earth, and life science and in investigation and experimentation in that grade.
- Your group will have about 8 minutes to present your lesson plan and standards choices. 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 partners.

## 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.

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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.)

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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. Hands-on Learning Cycle Science Lesson Design and 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 three 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 one 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 11-16 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.**

## LESSON DESIGN

### Elements of the Learning Experience

**Lesson Title:** What is the title of your lesson?

**Grade Level:** What is the 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 30 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**

*Give examples based on the different learning needs for K-3 and 4-6*

*Developmental age appropriate skills and needs of the students*

*Example: engaging activities (hands on, etc)*

### **Assessment Plan Tied to Learning Objectives**

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

*Description of assessment*

*Feedback strategies: how students will be informed of specific successes and challenges and future activities to fill the individual students gaps.*

*Reflection of the assessment: Strengths and weaknesses in relationship to the learning goal. Describe your alternative assessment based on the potential gaps in the students learning.*

### **Assessment Criteria Tied to Learning Objectives**

*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?*

### **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 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. Include suggested number of minutes for each component of the lesson.*

<b>The Learning Cycle</b>	<b>INSTRUCTIONAL STRATEGIES</b> <i>What the teacher does.</i>	<b>STUDENT ACTIVITIES</b> <i>What the students do.</i>
<u>Engagement</u>	How will you focus/motivate students? ___ mins	What will students be doing during the anticipatory set? ___ mins
<u>Exploration</u>	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
<u>Concept Invention</u> 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 <u>you</u> 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
<u>Concept Application</u>	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

## **Reflection**

**Explain why the instructional strategies, student activities and resources are appropriate for this lesson.**

- Why are the instructional strategies and student activities appropriate for this class based on content and student development?
- How do they address the developmental needs of these students?
- How do they help the students make progress toward achieving the state adopted academic content standards for students in this content area?
- Understand connections between lesson content and the outside world.

## **Differentiated Instruction based on the Learning Goals and instructional Strategies:**

### **1. English Learner**

<b>TASKS</b>	<b>Beginning EL</b>	<b>Intermediate EL</b>	<b>Advanced EL</b>
Identify 2 specific learning needs based on the student description			
Identify one instructional strategy or student activity that could challenge the student			
Explain why the strategy or activity you chose could challenge the student based on the learning needs of the 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 towards the goals of your lesson			
Explain how your adaptation would be effective for the student in making progress toward English language development			
What progress monitoring assessment would you choose to obtain evidence of the student's progress towards a learning goal?			
Give rationale for your choice of assessment. Use your knowledge of academic content in this lesson and this student's learning needs in your rationale.			

## 2. 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		
Explain why this strategy or activity could be challenging for the student based on your description		
Describe how you would adapt the strategy or activity to meet the needs of the student		
Explain how your adaption would be effective for the student making progress toward achieving the learning goal		
Identify one additional instructional strategy or student activity that could be challenging for the student considering their learning needs		
Explain why the strategy or activity you chose could be challenging for the student based on specific aspects of the student description		
Describe how you would adapt the strategy or activity you identified to meet the needs of the student		
What progress monitoring assessment would you choose to obtain evidence of the student's progress towards a learning goal?		
Give rationale for your choice of assessment. Use your knowledge of academic content in this lesson and this student's learning needs in your rationale.		

### 3. GATE

TASKS	Describe GATE students' needs:
Identify 1 instructional strategy or student activity from the plans that will be challenging for the student considering the description of your student	
Explain why this strategy or activity will be beyond the students current ability and will challenge the student based on your description	
Describe how you would adapt the strategy or activity to meet the needs of the student	
Explain how your adaption would be effective for helping the student make progress going beyond the learning goal	
Identify one additional instructional strategy or student activity that will be challenging for the student considering their learning needs	
Explain why the strategy or activity you chose will be challenging for the student based on specific aspects of the student description	
Describe how you would adapt the strategy or activity you identified to meet the needs of the student	
Explain how your adaptation would be effective for helping the student make progress toward going beyond achieving the learning goal	
What progress monitoring assessment would you choose to obtain evidence of the student's progress towards learning goal?	
Give rationale for your choice of assessment. Use your knowledge of academic content in this lesson and this student's learning needs in your rationale.	

Also include in Lesson Design:

**Applications to Everyday Life and Explanations (at least 3):**

**Science Content Background:** (1-2 pages minimum) summary of the content background

**Web Sites:** at least 3 interactive relevant web sites with descriptions

**Children's Literature Books:** Title, author, publisher, year of 2 children's books on the topic.

**References:** Title, author, publisher, year

## **5. 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, title of the lesson and the number of the Drawing. Label each of your drawings legibly.** 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. **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 of the lesson, and the number of the Explanation. Your writing should be in legible, complete sentences.** 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.**

## **6. Science Exploratorium Lesson Plan & Presentation (in pairs) – 15%**

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 (trifold) 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 in the lesson plan 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.

**Type up an abbreviated group Lesson Plan (due a week before the Science Fair Exploratorium) 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 (Life, Physical, or Earth Science) & Subject Matter (for example, air pressure)
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 student will demonstrate understanding of \_\_\_\_\_.
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. Description of the Learning Cycle Model of Instruction
  - a. Exploration (students start by making predictions followed by a hands-on science activity)
  - b. Concept Invention (students share findings from exploration; teacher gives concepts)
  - c. Concept Application Activity (a second hands-on science activity).

### **Exploratorium Reflection** (individual)

\*Turn in at class session after the Exploratorium.

\*Respond to 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 Curriculum/Presentation (teams of four; each writes one 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. For each unit, you will use the science standards (and their descriptions in the Science Framework) to design enduring understandings, unit learning objectives, an end-of-unit assessment plan, and rubrics 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-- the same group for your project in your science course. You will relate the science course project topic to this Science Curriculum 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 student teaching.

**Year-Long Science Curriculum for Grade \_\_\_\_**

**Overview of Year-Long Curriculum (Page 1 of Unit):**

**Units**

**Brief description of each unit.**

**Authors**

**Unit 1:**

**Description:**

**Unit 2:**

**Description:**

**Unit 3:**

**Description:**

**Unit 4:**

**Description:**

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**10. Assessment Plan**

Days can be flexible due to where it is placed in the unit plan. Indicate the day in the second row.

ASSESSMENT	1	2	3	4 Final Cumulative Assessment
Which day of the unit?	DAY :	DAY :	DAY:	DAY :
<b>Goals Assessed:</b> Based on the content standards and learning goals				
<b>Type &amp; Description</b>  What type of assessment will be given? <u>Prior knowledge</u> (pre assessment), <u>Formative</u> (progress monitoring), <u>Summative</u> (final assessment).  Write out a description of the assessment.				
<b>Purpose</b> Reason for the assessment				
<b>Implementation and Criteria</b>  How will the assessment be conducted and corrected?  What criteria will you use? (What will you look at when grading?)				
<b>Feedback strategies</b>  How students will be informed of successes and challenges				
<b>Informing instruction</b>  Determine what material will need review for identified students, the students who are near mastery and students who have learned the material and need extension.				

**Reflection of Assessment: Strengths and Weaknesses in relationship to the learning goal.**

Identify one strength in the assessment plan and explain why it is a strength in relation to the learning goals.	
Identify one weakness in the assessment plan and explain why it is a weakness in relation to the learning goals in this unit.	

**Additional Assessment:** Describe your alternative assessment based on potential gaps in the students' learning. Project what additional assessments might be needed to determine mastery of the content standards and learning goals.

<b>List of Additional Assessments</b>

**Another Additional Assessment:** You might have found this assessment in supplementary resources or teacher made. Write the additional assessment you would use to check student understanding.

<b>Describe Additional assessment</b>

Write your reasons why you feel this supplemental assessment would benefit student learning and improve your assessment plan by answering these reflective questions. Example: Answer the reflective questions based on how you as the teacher might use these to improve the assessment plan.

When in the plan would you use this assessment? What days would you use this supplemental assessment to give you further information on the progress of your students?	
What goals would be assessed by this assessment? What additional information would you look for to ensure you have assessed the learning goals and content standards?	
What type of assessment would it be? Formal or informal. Where did the assessment come from?	
What would be the purpose of the assessment? Example: Example: reason for the assessment and what knowledge and skills are acquired.	
How would you implement the assessment? How the assessment will be conducted and corrected	
What feedback strategies would you use? How would you inform students of their successes and challenges?	
How would the results of the assessment inform instruction? Determine what material will need review for identified students, the students who are near mastery and students who have learned the material and need extension.	

Explain how the additional assessment you described improves your assessment plan.

Address the teacher's dilemma and need for more information about what the students really know and understand. Determine what the possible misconceptions might be and the student progress toward achieving the learning goals.	
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### 11. Ideas for 3 Lessons for each Unit.

**For each of three lessons, provide the following:**

**Grade Level:** What is the grade level?

**Lesson Title:** What is the title of your lesson?

**Student Groupings:** How will you group students for instruction?

**Content Area:** Science

**Subject Matter:** Life, Science Physical Science or Earth Science?

**Time Period for the Learning Experience:** *Example: two 30 minute sessions science*

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

**Learning Objectives 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 \_\_\_\_\_."

**Science Concept(s):** What are you trying to teach? Do not say "The students will \_\_\_\_." (That is an objective, not a concept.)

**Essential Questions** (higher level; see Bloom's taxonomy): What are your essential questions for this concept? What leads to the big idea? (be sure these are not lower level fact or info. questions)

**Resources:** What will the teacher need? What will the students need?

**Instructional Strategies/Lesson Procedures Using The Learning Cycle Model of Instruction**

BRIEFLY Explain the procedures for each phase of the Learning cycle.

<p><b>The Learning Cycle</b></p>	<p><b>INSTRUCTIONAL STRATEGIES</b> <i>What the teacher does.</i></p>	<p><b>STUDENT ACTIVITIES</b> <i>What the students do.</i></p>
<p><u>Engagement</u></p>	<p>How will you focus/motivate students? ___ mins</p>	<p>What will students be doing during the anticipatory set? ___ mins</p>
<p><u>Exploration</u></p>	<p>Explain what and how you will provide an exploration science activity (must be hands-on). ___ mins</p>	<p>Explain what students will be doing during the exploration activity. ___ mins</p>
<p><u>Concept Invention</u> a. Students share what they did and learned during Exploration b. Teacher introduces students to new information.</p>	<p>How will you have students share their ideas, knowledge and questions from the exploration phase? Explain how <u>you</u> will introduce students to relevant information, terminology and concepts to reinforce what they learned during exploration. ___ mins</p>	<p>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</p>
<p><u>Concept Application</u></p>	<p>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</p>	<p>Explain what students will be doing during the concept application activity. ___ mins</p>

**8. Course Reflection: 5%**

Specific prompts will be provided in class



2/23/09 Class 5	<p>Turn in Reading Journal</p> <ul style="list-style-type: none"> <li>• <b>Work on Science Curriculum Unit: Grade Level Groups</b></li> <li>• Performance Assessments</li> <li>• Developing Criteria for Assessing Learning and Using Rubrics to Show Criteria</li> <li>• Instructor Led Learning Cycle Lesson on <b>Light</b> (in Ch. 9)</li> <li>• <b>Team 3</b> Learning Cycle Lesson on topic from Ch. 9</li> <li>• Team time for Learning Cycle Lessons</li> </ul> <p><b>For next session:</b> Draw Concept Map on Ch 9 or 10 in Blue Book.</p>	9 and 10
3/02/09 Class 6	<p>Turn in Reading Journal</p> <ul style="list-style-type: none"> <li>• NSTA Position Statements on Elementary Science and Assessments</li> <li>• Integrating Writing into Science Activities</li> <li>• <b>Work on Science Curriculum Unit: Grade Level Groups</b></li> <li>• Instructor Led Learning Cycle Lesson on <b>Flight</b> (in Ch. 11)</li> <li>• Select Partners for Science Exploratorium (work in pairs)</li> <li>• <b>Team 4</b> Learning Cycle Lesson on topic from Ch. 12</li> </ul> <p><b>For next session:</b> Draw Concept Map on Ch 11 or 12 in Blue Book</p>	11 and 12
3/09/09 Class 7	<p>Turn in Reading Journal</p> <ul style="list-style-type: none"> <li>• <b>Work on Science Curriculum Unit: Grade Level Groups</b></li> <li>• Instructor Led Learning Cycle Lesson on <b>Geology/Topography</b> (Ch. 15)</li> <li>• Inclusion and Teaching Science to Students with Special Needs</li> <li>• <b>Team 5</b> Learning Cycle Lesson on topic from Ch. 14</li> <li>• <b>Team 6</b> Learning Cycle Lesson on topic from Ch. 13</li> <li>• Science Exploratorium Planning time</li> </ul> <p><b>For next session:</b> Draw Concept Map on Ch. 13 or 14 or 15 in Blue Book.</p>	13, 14, and 15
3/16/09 Class 8	<p>Turn in Reading Journal</p> <ul style="list-style-type: none"> <li>• Turn in abbreviated Lesson for Science Exploratorium and “Data Sheet”</li> <li>• <b>Work on Science Curriculum Unit: Grade Level Groups</b></li> <li>• Instructor Led Learning Cycle Lesson on <b>Animals</b> (Ch. 19)</li> <li>• Inclusion and Teaching Science to Students with Special Needs</li> <li>• <b>Team 7</b> Learning Cycle Lesson on topic from Ch. 16</li> </ul> <p><b>For next session:</b> Draw Concept Map on Ch. 16 or 18 or 19 in Blue Book.</p>	16, 18, and 19
3/23/09 Class 9	<p><u>Meet at Jack’s Pond Nature Center; We will begin at 1:15</u></p> <ul style="list-style-type: none"> <li>• Turn in Reading Journal.</li> <li>• <b>DUE:</b> Turn in Learning Cycle Lesson Drawings and Explanations Lab Book</li> <li>• Nature Center Lesson Activities</li> </ul> <p><b>For next session:</b> Draw Concept Map on Ch 17 or 20 in Blue Book.</p>	17 and 20
3/30/ – 4/04/09	<b>SPRING BREAK</b>	
4/06/09 Class 10	<p><u>12:00 PM: Meet at an Elementary School for Exploratorium- Location TBD</u></p> <ul style="list-style-type: none"> <li>• Bring copies of Data Sheets for the elementary children</li> <li>• Turn in Reading Journal</li> <li>• Upload Exploratorium Lesson Plan and Data Sheet to WebCT Discussion Thread</li> </ul> <p><b>For next session:</b> Draw Concept Map on Ch. 21 in Blue Book.</p>	21

4/13/09 Class 11	Turn in Reading Journal Turn in Exploratorium Reflection <ul style="list-style-type: none"> <li>• Exploratorium Discussion</li> <li>• Science Projects, Student Research, Science Fairs</li> <li>• <a href="#">Computer Lab: Work on Science Curriculum Units</a></li> <li>• <a href="#">Instructor Led Learning Cycle Lesson on Plants (Ch. 18)</a></li> </ul>	
4/20/09 Class 12	<ul style="list-style-type: none"> <li>• Required: bring <b>2 copies of Curriculum Unit Draft/Review/Assess/Revise</b> If necessary</li> <li>• National Science Education Standards and Benchmarks</li> <li>• Science Kits</li> <li>• Current Issues in Science Education</li> <li>• Instructor Led Learning Cycle Lesson on <a href="#">Bones</a> (Ch. 21)</li> </ul>	
4/27/09 Class 13	<ul style="list-style-type: none"> <li>• <b>DUE:</b> Turn in Final copy of Science Curriculum Units</li> <li>• Upload Curriculum Units to WebCT Discussion Thread</li> <li>• Begin Course Reflection</li> </ul>	
5/04/09 Class 14	Last Class <ul style="list-style-type: none"> <li>• Curriculum Presentations</li> <li>• Course Evaluations</li> <li>• <b>DUE:</b> Course Reflection</li> </ul>	

\*\*\***Note:** Complete 3 Concept Maps from your choice of 3 Chapter readings. Each Concept Map is due on the date the chapter reading is due per the course schedule