

**CALIFORNIA STATE UNIVERSITY SAN MARCOS**  
**COLLEGE OF EDUCATION**  
**EDMI 545 – Middle Level Science Education**  
**Spring 2009 – Meeting Time: Class Time Varies – See Class Schedule**  
**Woodland Park Middle School**

General Information:

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Office Hours: After each class

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

**Mission Statement**

The mission of the College of Education Community is to collaboratively transform public education by preparing thoughtful educators and advancing professional practices. We are committed to diversity, educational equity, and social justice, exemplified through reflective teaching, life-long learning, innovative research, and ongoing service. Our practices demonstrate a commitment to student-centered education, diversity, collaboration, professionalism, and shared governance.

**Required Textbooks:**

- Abruscato, J. (2004). Teaching Children Science: A Discovery Approach, MyLabSchool Edition, SafariX eTextbook, 6/E (Text available via online subscription for half the price of the print copy at: <http://www.safarix.com/0205463649>)
- California Department of Education (2003). *Science Framework for California Public Schools*. Sacramento, CA: CDE. [Also available online.](#)

*Other handouts will be distributed in class or through WebCT*

These and many other hands-on science books are in bookstores, museums, zoos, even grocery stores!

**COURSE DESCRIPTION**

This course focuses on developing an understanding of theory, methodology, and assessment of science in integrated and inclusive elementary and middle school 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 and middle school children. A series of team activities will provide you with first-hand

experiences in these areas. This course focuses on instructional methods, techniques, materials, lesson planning, curriculum development, organization and assessment in science. The integration of curricular areas is addressed. Methods of cross-cultural language and academic development will be integrated into the course.

**Course Prerequisites:**

Admission to the Multiple Subject Credential Program/CLAD Teacher Credential Program.

**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 and middle school children.
3. Demonstrate knowledge and understanding of the California Science Framework, the California Science Content Standards, and the National Science Education Standards.
4. Demonstrate an understanding of the physical, earth and life science concepts included in the K-8 California Science Content Standards, and how to design lessons to teach the concepts.
5. Use the Learning Cycle model of instruction to teach science in a contemporary manner.
6. Use technology in elementary and middle school science teaching.
7. Demonstrate confidence in leading and performing investigations designed to teach science concepts, science process skills, and scientific attitudes.
8. Use authentic methods of assessment to evaluate student learning of science concepts and processes.
9. Design an elementary and middle school science-teaching mini-unit.
10. Practice strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs).

**INFUSED COMPETENCIES**

**Authorization to Teach English Learners**

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

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

**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>

### **Special Education**

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

### **Technology**

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

### **\*\*\*Computer Use During Class**

*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!*

## **COURSE REQUIREMENTS**

### **COE Attendance Policy**

Due to the dynamic and interactive nature of courses in the College of Education, all students are expected to attend all classes and participate actively. 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, each class session that you are absent from class drops your maximum final grade by 5% points. Late arrivals and early departures will affect your final grade as well. For each late arrival or early departure you will lose 2% points. A make-up assignment will be available only for up to 10% points. This means that if you are absent once and complete a make-up assignment and earn full credit on this assignment, you will receive no penalty on attendance. The make-up assignment applies to ALL absences excused or otherwise. Absences do not change assignment due dates.

## **Writing**

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

## **Students with Disabilities Requiring Reasonable Accommodations**

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

## **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. 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 cases of academic dishonesty will be reported to the Dean of Students.

## **Plagiarism:**

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.

## **TOPICS OUTLINE**

The Nature of Science

The Learning Cycle Model of Teaching

Learning Cycle Science Lesson Demonstrations

Writing Objectives for Student Learning

Writing Science Concept Definitions

CA Science Content Standards Grades K-8

California Science Framework

SDAIE Strategies in Science

Infusing Writing Activities in Science Lessons

Science Curriculum Kits and State Approved Texts

Science Process Skills and Scientific Attitudes

Current Issues in Science Education

Infusing Technology into Science Teaching

Authentic Assessments in Science  
Science Projects, Student Research, Science Fairs  
Safety in the Science Class  
Inclusion and Teaching Science to Students with Special Needs

### **COURSE ASSIGNMENTS AND LEARNING OUTCOMES**

1. Class Participation (Individually) - 10%
2. Reading Accountability Journal Entries (RAJEs/Concept Maps) (Individually) - 20%
3. Learning Cycle Hands-on Science Lesson Plan & Presentation (In Groups, sizes TBD) - 20%
4. Hands-on Science Lesson Reflection (Individually)– 5%
5. Science Fair Exploratorium Lesson & Presentation (Groups sizes TBD) – 20%
6. Science Fair Exploratorium Reflection (Individually) – 5 points
7. Integrated Science & Social Studies Unit - 20%
8. Make Up Assignment – Up to 10% points for missed class (Individually)

ALL WRITING ASSIGNMENTS ARE SUBMITTED AS A HARD COPY TO THE INSTRUCTOR AND AN ELECTRONIC COPY POSTED TO WEBCT AS A CLASS RESOURCE.

Each student is responsible for ensuring that assignments are submitted correctly and on time. Late assignments will be penalized by a 10%-point reduction each day they are late. WebCT required postings not correctly posted do not count as submitted and will be subjected to the late assignment policy. Keep digital copies of all assignments for your Credential Program Electronic Portfolio where necessary. You will not be assigned a course grade unless all the required assignments are turned in.

### **CRITERIA FOR GRADING ASSIGNMENTS**

- 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.

The above criteria will be applied in conjunction with specific assignment rubrics

Grades will be determined by points earned:

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

## **ASSIGNMENT DESCRIPTIONS**

### **1. Active Participation and Collaboration - 10%**

Teacher education is a professional preparation program and students will be expected to adhere to standards of dependability, professionalism, and academic honesty.

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

**Class Discussions and Participation:** Students will engage in active learning each class session, and will be expected to actively participate. You may lose 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. Reading Accountability Journal Entries (RAJEs)/Concept Maps – 20% points**

**See class schedule for due dates**

The assigned readings provide an important foundation for your increasing understanding of science content and how to effectively teach science. To aid you in remembering the readings, and assist you with meaningful class participation, you are asked to respond to the reading assignment by coming to class with a concept map entry in your Reading Accountability Journal. Reading accountability journals will be due at the beginning of class time on the assigned dates. You will only receive credit points if journal entries are completed by the start of class on date indicated in the schedule.

Chapters from the course text *Teaching Children Science: A Discovery Approach*, will be designated for specific class meetings (see class schedule for chapter assignment). You will read the chapter to develop an in-depth understanding of its contents. For the chosen chapter you will prepare a concept map (15-25 concepts with linking words), using correct **concept mapping procedures**. The concept maps should be generated using a concept mapping software of your choice. Some recommended software include; Cmap Tools (free download available at [http://cmap.ihmc.us/download/dlp\\_CmapTools.php?myPlat=Win](http://cmap.ihmc.us/download/dlp_CmapTools.php?myPlat=Win)) or inspiration (free trial download available at [www.inspiration.com](http://www.inspiration.com)). You must print and bring a copy of your concept map to class. We will share the concept maps with peers in at the beginning of each class session. Put your name,

chapter and date when the reading was assigned at the top of each page. You should be prepared to share in depth the breadth of your concepts presented in the chapter you read. Individuals will be called on randomly to share their concept maps in class. You will automatically lose half the points on the days RAJE if you are unable to share the concepts with the class.

Each concept map has a possible total of 4 points.

- a. Most general, inclusive Concept at top/center.....worth 1 point
- b. 15-25 concepts included showing clear hierarchy or relationships .....worth 1 point
- c. 1-2 words (nouns) for Concepts.....worth 1 point
- d. Verbs or prepositions for Linking Words between Concept...worth 1 point

### **3. Hands-On Science Lesson Plan & Presentation –20 Points - Due on assigned day for the lesson**

Spirit of the Assignment: to develop and teach a particular kind of a science inquiry lesson that teaches both science thought processes and science content.

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 allocated a maximum of 30 minutes of class time to teach their lesson. Use activities from the textbook, Internet sites or other science resources. The team should teach the lesson as you would to elementary and middle school students. However do not ask your colleagues to act as elementary and middle school kids.

Each group will be assigned a specific grade level for which you will plan and teach the lesson. This will determine the grade level and California Science Standards your lessons will cover. The group will work together reviewing each other's lesson ideas, sharing resources, and making sure each member presents a different part of the lesson. Collaboration between group members is essential to divide up the work, and support each other.

The lessons should follow the Learning Cycle Instructional Model, must include hands-on activities, and should emphasize specific science concepts. The Exploration and Application phases of the Learning Cycle must require different hands-on science activities using manipulatives. **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-8 grade students, and should follow the NSTA Safety Guidelines.

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

Prepare a PowerPoint Presentation to use in your lesson. The presentation should include a Summarized explanation of the science content, as well as a list and definitions of science concepts important to the lesson. Include a list of 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.

### **Science Lesson Handout**

- Prepare a handout which includes the information under Lesson Plan Format, making sure you include:
  - team members' names at the top
  - References at the bottom.

IMPORTANT NOTE: You should post a copy of the lesson plan on WebCT for access by your classmates and bring one copy to class for the Instructor on the day of your presentation.

After your presentation (by the next class), turn in your **Reflection as described in assignment #4.**

### **Lesson Plan Format – The required lesson plan format will be presented in class**

#### **4. Hands-on Learning Cycle Lesson Reflection – 5% points**

After teaching the lesson in class, you should each complete a lesson reflection. The reflection should include strengths, weaknesses, and recommendations for improvement addressing the following questions:

- *Why were the instructional strategies and student activities appropriate for this class based on content and student development?*
- *How did they address the development need of these students?*
- *How did the instructional strategies and student activities help the students make progress toward achieving the state adopted academic content standards for student in this content area?*
- *Explain the strengths and weaknesses of your assessment in relationship to the learning goals/objectives. Describe your alternative assessment based on the potential gaps in the students learning.*

#### **5. Science Fair Exploratorium Lesson & Presentation: 20 Points**

Develop an inquiry activity that uses a discrepant event appropriate for elementary and middle school 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 or middle School Science Fair Exploratorium. The audience will be 6th grade students at an elementary or middle 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.

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



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

1. Science Concept (and definition) you are teaching. Write it out in a complete sentence. Do not say “The students will \_\_\_\_.” (That is an objective, not a science concept.)
2. Essential Questions
3. 1-3 Behavioral Objectives
4. California Science Content Standards addressed
5. Exploration Activity
6. Concept Invention
7. Concept Application Activity

**6. Science Fair Exploratorium Reflection (answer the following): 5% points**

- a. How did the children respond? (What did they say and do?)
- a. What and how do the children’s actions and responses demonstrate about their level of understanding?
- b. How did you (or can you) improve upon your lesson to facilitate understanding?

**7. Science Teaching Unit and Presentation—20 Points**

The goal of this assignment is for the student to develop long term planning for instruction as well as developing skill for integrated teaching in middle school grades. For this assignment, you will plan a unit of instruction for an appropriate grade for an interdisciplinary team that includes science and other subject areas as desired. This unit will be appropriate for approximately two – three weeks of instruction for a heterogeneous elementary classroom. Details of this assignment will be shared in class. Pay attention to the description when completing this assignment.

**8 . Make-Up Assignment – 10% points make up for missed class or late arrivals/early departures:**

By completing this assignment you have the opportunity to offset penalty points for missing up to two classes or a combination of up to three late arrivals and/or early departures. Attend a science related informal science site or formal event or presentation equivalent in time and effort to one class session (3 hrs). This could be a field trip, museum, lecture or some other equivalent experience that will assist you either directly or indirectly in becoming a science teacher. To complete this requirement: 1) complete a one-page summary of the science you learned from the site and applications to teaching; 2) send by email to all of us; 3) do a 5 minute PowerPoint presentation to the class during class one of the classes. Your presentation should be such that we see a snapshot of how you spent a minimum of three hours and the corresponding learning during this visit. Discuss with the instructor about the class time in which you may do the presentation. The report and oral presentation should include a summary of what you learned and implications for your own teaching.

**RESOURCES**

**JOURNALS**

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

**APENDIX A: Tentative Class Schedule**

<b>Class</b>	<b>Date</b>	<b>Topic</b>	<b>Readings &amp; Work Due</b>
1	1/21 AM	Course Overview The Nature of Science and Inquiry Process in Science	Bring Syllabus to class <i>-Read Chapter 1 of Abruscato</i>
2	1/27 PM	What are the overarching themes that we want our students to learn in science? -Focus on standards and Frameworks	-Bring Science Education Standards to Class - Read the CA Science Framework pgs 1-32 <i>-Read Chapter 2 of Abruscato</i>
3	1/28 PM	-Using the Learning Cycle to teach science as inquiry – Balancing Activity	-Read Learning Cycle Handout on WebCT and bring a copy to class <i>-Read Chapter 3 of Abruscato</i>
4	2/03 PM	What shall we use as the best indicators that students have learned and understand the intended outcomes? -Focus on Assessment – Pendulum Activity	<i>Read Chapter 11 of Abruscato</i> <b>- RAJE Due on Ch. 11A</b>
5	2/04 AM	How shall we sequence the learning activities so that students can learn the intended themes? – Lesson Planning -Focus on sequencing instruction – Circuits Activity	<i>-Read Chapter 4 of Abruscato</i> Draft Lesson Plans Due at end of class
6	2/11 PM	What Activities of Teaching shall we use to make the content accessible to ALL students? -Hands-on Lessons – Focus on 6 <sup>th</sup> grade	<b>- Hands-on lesson Presentations x 3</b>
7	2/13 PM	What Activities of Teaching shall we use to make the content accessible to ALL students? -Hands-on Lessons – Focus on 7 <sup>th</sup> grade	<i>Read Chapter 15 of Abruscato</i> <b>- RAJE Due on Ch. 15A</b>  <b>-Hands-on lesson Presentations x 3</b>
8	2/20 AM	What Activities of Teaching shall we use to make the content accessible to ALL students? -Hands-on Lessons – Focus on 8 <sup>th</sup> grade	<b>-Hands-on lesson Presentations x 3</b> <i>Read Chapter 17 of Abruscato</i> <b>- RAJE Due on Ch. 17A</b>
9	2/24 PM	What strategies can use to ensure participations of ALL students in science learning? -Hands-on Lessons – Focus on 4-5 <sup>th</sup> grades	<b>- Hands-on lesson Presentations x 3</b>
10	2/25 AM	Developing Science WebQuests & Technology for science Teaching	<i>Read Chapter 18 of Abruscato</i> <b>- RAJE Due on Ch. 18A</b>
11	2/25 P.M.	-Units Planning & Integrating Science with other subjects -Adapting Science curriculum for children with Special Needs – Guest Speakers	
12	3/03 PM	Developing Unit Assessment plans  Science Projects, Student Research, Science Fairs and Science Safety	<i>Read Chapter 14 of Abruscato</i> <b>- RAJE Due on Ch. 14A</b>  <b>-Sc. Fair Lesson Plan Due</b>
13	3/06 AM	Science Fair with kids	<b>Science Fair Presentations</b>
14	3/06 PM	Science Fair with Kids	<b>Science Fair Presentations</b>
15	3/11AM	Course Review and Reflection	<b>- Science Fair Reflection Due via WebCT</b>

*RAJE = Reading Accountability Journal Entry*