

**California State University San Marcos**  
**College of Education**  
**EDMS 545**  
**Science Education in Elementary Schools**

Spring, 2005 3 credits, Multisubject Cohorts

**Instructor: Joseph Keating, PhD Professor of Science Education**

Office: UH 309

Phone: (760)750-4321

Email: [jkeating@csusm.edu](mailto:jkeating@csusm.edu)

**The Mission of the College of Education Community is to collaboratively transform public education by preparing thoughtful educators and advancing professional practice. 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.**

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, for confidentiality, in a more private setting.

**Required Texts:**

Keating. Science Methods

Keating. Use of Discrepant Events for Teaching Science

Sections of the California State Science Framework and Standards

Buy from Bookstore

Photocopy – Syllabus director will have a copy

California State Dept of Ed website

**Optional Texts:**

Chancer, et. al. Moon Journals

Sae. Chemical Magic from the Grocery Store

**Purpose and Goals:**

The main purpose of this course is to help you become a better teacher of science while increasing your enthusiasm, interest and confidence in effective teaching methods. You

will model and practice ways in which science can be naturally integrated into all the other disciplines. There will be a special emphasis on a student centered, problem solving and divergent interdisciplinary approach to learning. Techniques for infusing multicultural aspects of science and adapting lessons to meet individual needs will also be addressed. As a result of this experience, we hope that as a teacher at the elementary level you will feel comfortable teaching science, teaming with teachers who are specialists in this field, and utilizing science methods in your other disciplines.

### **Objectives:**

On completion of this course, students will be able to demonstrate the following:

1. knowledge of the California Framework and Standards in science;
2. understanding of how to integrate science into other curriculum areas;
3. awareness of the multitude of community resources available to teachers and the ways in which these resources can be used to strengthen the science program;
4. the ability to write lesson plans and implement them into an integrated unit based on an appropriate grade-level course of content;
5. the ability to design curricula which reflect a variety of instructional strategies and develop children's higher-level thinking skills;
6. an understanding and appreciation for the processes of science
7. including all children in science instruction

### **Grading Policy:**

Final grades for EDMS 545 will be computed on a scale of 170 points

A = 94-

A- = 90-93 %

B = 84-89 %

B- = 80-83

C+ = 77-79

(Anything less than a C+ does not count toward a California Teaching Credential)

Prompt and consistent attendance is vital to success in this class. Attendance will be taken and class will start on time. For each absence, five points will be deducted. For each tardy, one or two points will be deducted, depending on how late you are. You'll also lose one or two points if you leave early. If a serious problem arises, which is beyond your control, please talk to the instructor.

### **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.

**Due Dates:**

When you come to class, we expect you to have the readings already done for that class. Assignments must be turned in at the start of class, otherwise they will be considered tardy. Late assignments will lose ten percent of their points for each day they are late. After one week, they will receive no credit. **IF FOR SOME REASON YOU MUST TURN IN AN ASSIGNMENT LATE, TALK WITH AN INSTRUCTOR AND MAKE SURE AN AGREEMENT IS NOTED ON THE GRADESHEET.**

**Please Also Note:** Any evidence of cheating (including plagiarism--presenting the words or ideas of others as your own) will result in a failing grade for that assignment and possibly a failing grade for the course. Some assignments will include comments and suggestions on appropriate referencing. If you have modified an already existing lesson plan or unit, please include a copy of the original lesson plan. See one of us if you have any questions about what exactly constitutes plagiarism.

**pla-gia-rize**

1. to use and pass off as one's own (the ideas and writings of another)
2. to appropriate for use as one's own passages or ideas from (another)

The American Heritage Dictionary of the English Language  
Third Edition

Proper attribution is an important concept for teachers. Giving credit where credit is due is only fair and ethical. It also advances learning by accurately tracking the path of ideas and information as they pass from person to person, often being enhanced and modified along the way. Teachers have a special responsibility to identify their sources in their own work, and to teach students to do the same.

Such attribution can be formal or informal. Formal attribution usually consists of footnotes and bibliographies which follow guidelines such as those published by the APA. Teachers and elementary students are more likely to use informal attribution, for instance giving the original source of a lesson plan that you have adapted. Even a second grader writing a paragraph about an animal can tell where the information came from. Example: I watched the classroom guinea pig for five minutes a day for five days and read the book Guinea Pigs by Joe Blow.

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**The Two Commandments of Attribution**

1. When you use someone else's ideas, thoughts, or information, you must give credit to the source, and do so in a way that clearly identifies the source and makes it possible for other persons to find the original source for themselves.
2. When you use someone else's exact words, you must put those words in quotes. Commandment #1 still applies.

**Science Ed Assignments** The following are assignment prompts. Each prompt will be scored using a likert scale: no response (0) to exceptional (maximum possible points for that assignment) to total a possible 170 points. Due dates are on the timeline.

The criteria for grading are:

- Fully addressing the prompt.
- Clear, coherent writing. (If we have to re-read what you've written three times before we can make heads or tails of it, you will lose points.) You must demonstrate good understanding and appropriate interpretation of the topic.
- Correct spelling and grammar on final drafts. You are going to be a model for children on this, and need to get used to paying attention. Note: just running a spellcheck isn't always enough – it may miss homophones.

### **Assignment 1 – California Science Framework and Standards**

Spirit of the assignment: to read a portion of the California Science Framework and the Standard for a particular grade. You will write your individual response to the readings. Then you will work with your grade level team to prepare and do a presentation to the class. It's important that you do the reading and the writeups BEFORE you meet with your team.

#### **1a. Framework summary response I 10 points**

- Read the first part of the California Science Framework, up to page 20. This includes Board Policy, the Introduction and Chapters One and Two.
- Think about the reading holistically.
- Write about a page, in your own words, that answers these questions: What do you think are the most important ideas addressed in the reading? Were there any ideas in the reading which were very new to you, or which disagreed with something you thought?

#### **1b. Grade level Science standard response I 10 points**

- 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 example next page.

#### **1c .Team preparation and presentation T 5 points**

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

- Get together with your team. Look at the activities that everyone wrote up for Assignment 2b. Choose one.

- As a team, write up a lesson plan for the activity (with objectives, assessment, and a brief description of the activity}. Put it on chart paper or an overhead transparency 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.
- As a team, come up with a brief overview of the Science Standard 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.
- In 8 minutes or less, 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 of the group.

Sample response to Assignment 1b.

#### Grade Four

##### Physical Science

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

##### Investigation and Experimentation

6.f 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

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

##### Investigation and Experimentation

6.c. 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

5.c. 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

6.b. 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.

## **Assignment 2 – Discrepant Event**

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 practice your discrepant event on at least one school-age child and reflect on the child's responses and what they indicate about how much he/she understood. Working by yourself or with a partner you will actually present your discrepant event to the class and give a copy of the lesson plan to each class member. After all the discrepant events have been presented, you will take a quiz to demonstrate that you personally learned the important science concepts that were presented.

### **2a. Discrepant Event Lesson Plan and Presentation I or P 15 points**

- Working by yourself, or with a partner, find a discrepant event to do. You can get one from Discrepant Events, by Keating, or go to a bookstore or the children's section of the library and look for books on Science Tricks, or Science Magic.
- Get together the materials needed for the discrepant event. (If you can't get certain things, look for another event to do.)
- Practice doing the event. (If you can't get it to work, you may need to find another event to do.)
- Make sure you understand the science behind the event. If you got it from an internet website, there may be background info on the site. Another good place to look: the children's section of the public library. Find children's books on the topic in addition to or even preferably to books for adults. The children's books will explain things simply and will use the appropriate vocabulary for you to use with your students. Remember, you don't have to have a college-level understanding of the topic, just have good, accurate information at your students' level.
- Do your discrepant event with at least one school-age child and take careful notes on the child's responses. (This ties in with Assignment 3b.)
- Fill in the discrepant event cover sheet, including the two questions.

- On your assigned day, bring in your materials and equipment and do your discrepant event for/with the class. You are limited to 15 minutes presentation time.
- After presenting your event, give each member of the class a copy of the lesson plan.
- Turn in your lesson plan, the cover sheet and your individual journal.

**2b. Discrepant event journal** **I 15 points**

- After you have done your discrepant event with a child or children, look at your notes and think about how it went. (You may realize that your event needs to be modified before you do it with the class.)
- Write a description of what happened, with special attention to what the child said and did. Analyze the child's response: what portions of the event, and to what extent, did the child understand what was happening? Why or why not?

**2c. Discrepant event quiz** **I 10 points**

After all discrepant events have been presented in class, a quiz will be given on the content of the events. Dr. Joe Keating will design the quiz based on the questions submitted by each partner pair on their Discrepant Event Cover Sheet. *This quiz will be open notebook, but not open handout. That means you should take careful notes during each discrepant event presentation.*

**Assignment 3 – Observation/art/writing**

The spirit of this assignment is for you to observe something using all your senses, then use what you have observed to do a writing and an art activity from the book Moon Journals. You can use any kind of an experience for this: a walk on the beach, playing basketball, bathing a baby. Immediate experience is very important, so even it's something you've done many times before, do it again for this assignment. **DON'T DO IT FROM MEMORY.**

**3a. Observation** **I 5 points**

- Sign up for a particular day, from 1 to 28 in the Moon Journals book. Look at the Art Invitation and the Writing Invitation for your particular day. If you didn't buy the book, borrow it from the Moon Journals director or use one of the copies on reserve in the library and copy the relevant pages.
- Observe a natural event and take notes. You will need at least five specific details for each sense. Your notes can be in any format, and can be handwritten, as long as they are legible. If there is one sense that can't be used for your observation, give the reason why.) You will turn in your notes.

**3b. Art and Writing****I 15 points**

- Follow the directions in the Moon Journals book to the writing and art activities for your assigned day. Connect them to your observation for assignment 5a. If either the writing or the art won't work, see the instructor.
- Look in the Timeline for Art/Writing. On that day, bring your response to the Art and Writing Invitations to class for Show and Tell.
- REMEMBER—YOU ARE NOT GOING TO DO YOUR WRITING AND ART ABOUT THE MOON. YOU ARE GOING TO USE WHAT YOU OBSERVED, WHETHER IT'S WALKING ON THE BEACH OR BATHING A BABY.

**Assignment 4 – Inclusive Science**

The spirit of this assignment is for you to explore ways for you to make sure that every child you teach is welcomed and able to participate fully in all science activities. Through reading and internet research you will increase your awareness and gather information on issues/situations that can lead some children to be excluded. With your team, you will prepare and present a skit that illuminates one particular issue.

- Read the Chapter “Including All Children in Science” in Keating, Science Methods
- Join a group. Each group will address one of the following topics:  
Limited English  
Cultural Issues  
Gender issues  
Physical disability  
Cognitive disabilities and emotional disturbances

**4a. Internet research****I 10 points**

- Find resources on the internet (articles, websites) that are relevant to your group's topic. Make this material available to the other members of your group.
- Choose one website to report on. Consider the following items:
  1. Your name
  2. Site name and site address
  3. Your group's topic – Make sure you clarify in your report how the website connects to the topic, such as physical disability.
  4. How did you learn about this site?
  5. Brief description of the site
  6. Approximate time necessary to access and download desired information
  7. Can kids use this site? If so, how?
  8. Is the content in the site correct and accurate/
  9. Is it from an authoritative source?
  10. Is it free from stereotypes and bias?
  11. Is this the best medium for this information?
  12. Do the images enhance the content?
  13. Is the information useful to teachers?



14. Does the site respond to questions, or can you share results?
15. Is the site easy to navigate?
16. Are all the links current?
17. Is the home page concise and quick to view?
18. Are lengthy picture files saved for later pages?
19. Is the menu clear, informative and current?

Add whatever comments you feel are appropriate on the usefulness of the site. Give your overall impression of the site, especially whether you recommend it, and why. Write everything up so that the instructor, or other students, can read and understand it. Make a copy of your report for everyone in the class, and turn in a copy.

**4b. Team presentation (skit and discussion) T 5 points**

- Within your group, share material gathered on the internet
- Discuss the importance/main points/implications of your reading and research
- Use this as a context to develop a short skit (approximately five minutes followed by a two-three minute question and discussion period) that presents a scenario that:
  - a. demonstrates a student in a science class having difficulty with the content and/or with a teacher strategy
  - b. demonstrates a teacher alleviating the difficulty by modeling at least one effective practice or strategy. At least two others should be either shown or discussed.
  - c. At least three references to the readings/research (these references can be shown or discussed)
  - d. Concludes with a discussion facilitated by the group. This discussion should assess the audience's understanding of the issues presented. Your group should develop some questions or other assessment device.

The team will be graded on the presentation and discussion, according to these criteria:

- Was the scenario interesting (simple props, costumes, charts, sound effects, etc.)
- Was the dialogue lively?
- Was it humorous, or did it otherwise engage the emotions of the audience?
- Was it memorable? Did the class understand the important concepts, and will the class remember them?

**REMEMBER—IT'S BETTER TO SHOW THAN TO DESCRIBE. IT'S BETTER TO DEMONSTRATE THAN TO EXPLAIN.**

**Assignment #5      Appropriate Disposition      15 pts.**

*The Maintenance and Development of Positive Teacher Behaviors  
in the College of Education Courses*

(Affective Objectives)

Purpose/Rationale

A variety of practitioner and university research suggests the importance of linking affective objectives to all cognitive objectives in all subject areas (Roberts and Kellough, 2000) and the correspondence of particular teacher personal attributes considered critical to establishing this linkage to excellent teaching and learning (Baldwin, Keating and Bachman, 2003). Krathwohl, Bloom and Masia (1964) developed a useful taxonomy for teachers to use in implementing affective objectives. These are hierarchical from least internalized to most internalized: 1) receiving; 2) responding; 3) valuing; 4) organizing; 5) internalizing. Teachers should be integrating these expectations into their teaching but must also be able to demonstrate the attributes associated with these in their own learning.

In light of this, it is critical for pre-service teachers to be given an overall dispositional model (a range of behavioral expectations) that can be used by them, as future teachers, and that illustrates the importance of and encourages the practice of these attributes. These attributes generally reflect the high expectations of quality teaching such as enthusiasm, positive attitudes, positive interactions and supportive interpersonal relationships within the teaching environment. There is a general consensus within the educational community that these attributes are considered highly desirable professional qualities for teachers (with an obvious range of individual manifestations) that will assist in promoting successful teaching and learning outcomes for both teachers and their K-12 students.

5a.	Self pre-assessment	I	5 points
5b.	Instructor post-assessment	I	10 points

Scoring Criteria

Each of these seven “attributes” will be scored on a 5-point rubric with justification by the instructor at the end of each course and adjusted to reflect a potential maximum score of 20/20. Demonstrated improvement for an individual in any area will be used as a strong consideration in the scoring of these attributes. Peer input and intermediate conferences will assist in formative assessments.

- 5 = Excellent qualities demonstrated for this attribute as noted with justification (no evidence of sub par examples)
- 4 = Above average qualities demonstrated for this attribute as noted with justification (few or no sub par examples)
- 3 = Average qualities demonstrated for this attribute as noted with justification (some limitations or examples noted)
- 2 = Below average qualities demonstrated for this attribute (numerous limitations or examples)

noted)  
1 = Well below average qualities demonstrated for this attribute (serious overall  
limitations  
noted in this area)

**Generally Accepted Attributes of Highly Effective Teachers**  
**(as seen in pre-service programs)**

(Roberts and Kellough, 2000; Stone, 2002; McEwan, 2002; Baldwin,  
Keating and Bachman, 2003; Johnson and Johnson, 1994; COE Mission Statement, 1997)

The following will be used as a guideline to assess the level of attainment (and progress) in demonstrating these attributes (to be 20% or less of course grade).

- 1) **General classroom attendance, promptness, and participation:** is on time, respects time boundaries (breaks, etc.), regularly attends class, and actively participates.
- 2) **Attention to classroom discussion protocols** (per Epstein's Five Stage Rocket): respects time limitations, recognizes and respects the perspectives of fellow classmates, gives wait time, listens actively, uses non-interruptive skills, mediates disagreements by working to understand others' perspectives and finding common ground, genuinely encourages all to participate.
- 3) **Social and cooperative skills (as illustrated in cooperative projects):** assumes responsibility of one's roles, is open to consensus and mediation, effectively communicates ideas, attends group meetings, is dependable, respects others' ideas, expects quality work from self and colleagues, manages time effectively, uses organizational skills and leadership skills, is assertive but not aggressive, uses reflection as a means of evaluation, motivates and offers positive reinforcement to others.
- 4) **Attention to assignments:** meets time deadlines, produces quality products, responds cooperatively to constructive criticism, uses rubrics or other stipulated criteria to shape an assignment, prioritizes tasks and performs/supervises several tasks at once.
- 5) **General classroom demeanor:** is professional, creative, kind, sensitive, respectful, has a sense of humor, is supportive of fellow classmates and instructors; recognizes others' perspectives as valid and works to include all "voices" in the classroom; is aware of and responsive to issues and behaviors that might marginalize colleagues in the classroom.
- 6) **Flexibility:** is responsive when reasonable adjustments to the syllabus, curriculum, schedule, and school site assignments become necessary (common to the educational arena); can work through frustrations by problem-solving with

others and not letting emotional responses dominate or impair thinking; “bounces” back easily; can work calmly under stress.

- 7) **Openness to and enthusiasm for learning:** can engage with a variety of educational ideas with an open mind and a sense of exploration; demonstrates passion for and metacognition of learning across the curriculum and within discipline areas; takes advantage of learning opportunities and seeks out additional opportunities for learning.

**Assignment # 6 Map and Compass** (Model of Interdisciplinary Teaching and Authentic assessment) 10 Pts. Done in class

**Assignment #7 Using Field Trips in Science** (WAP Field Trip) 20 pts.

**Assignment #8 Problem Solving (Odyssey of the Mind and Invention Convention)** 10 pts in class

### **EXTRA CREDIT**

All students can gain extra credit for certain in-class and out-of-class activities. *There is a cap of 8 points that can be applied to your grade.*

- Read up to three articles concerning science or science education and write a one-page reaction paper on each article. Articles must be current – must have a 2002 or 2003 publication date. They can be from scholarly journals, or ERIC, from the internet, from the newspaper, or from general interest publications. Please make sure to include the Author, Title, Publication Name, and Date of Publication. 2 points per article.

**Your response should include the following: about half a page summary of the article, written so that an average fourth or fifth grader could understand it, AND about half a page of your thoughts on the significance of the article, particularly in regards to teaching science to children.**

*HINT: Pick an article that you are comfortable reading and that you feel you understand well. If you are not accustomed to reading heavy-duty science material, then stick with articles from the newspaper or from general interest publications.*

- Watch a television show or movie that deals with science or science education and write a one page reaction paper. (Examples: October Sky, Bill Nye the Science Guy). **Use the same guidelines as are in bold type up above.** 2 points per report
- Be a director, according to the list below. 4 points

Director of Directors – Assigns Directorships – keeps list

Syllabus director – holds a hard copy of the Syllabus so other students can make copies.

Name Tag Director – Make sure everybody has a name tag each class

Contact Information Director—Make class list with current contact info

Framework/Standards Copies Manager/Director of Presentations – holds hard copies of the grade level standards and Chapters 1 and 2 of the Syllabus, for students to copy. Also directs formation of grade-level groups for presentations.

Cooking Activity Director (bring in something to cover a table, and a large trash bag. Help with setup and cleanup.)

Lesson planning small group discussion scheduler

Librarian – keep track of books borrowed by students

Photographer – takes photos of various class activities. Shows them to class.

Webmaster – Find science/science ed websites – present to class

Moon Journals assignments coordinator – keep copies of book, assign days

Inclusive Science presentations coordinator—form teams