

CALIFORNIA STATE UNIVERSITY, SAN MARCOS
COLLEGE OF EDUCATION
EDSS 545 A and B Secondary Science Methods
(4.0 Credits) Fall and Spring 2009-10

Instructor: Joseph Keating, Ph.D.

Office: UH 315 Phone: 760-7504321

Office hours: By arrangement

E-mail: jkeating@csusm.edu

Location: UH 460 at 5:30-8:30 on Tuesday (note syllabus for a few exceptions on Saturday)

College of Education 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: Admission to the Single Subject Program or pursuit of a single subject add-on credential (by permission) is required to enroll in this course.

Description/ Goals: This course will be held both fall and spring semesters for a total of 4 credits (approximately 30 contact hours per semester, 2 credits per semester). It fulfills the requirement for a methods course for all Single Subject Science credential students. Upon completion of this course, the preservice teacher will be able to formulate a basis to teach standards based science course in the secondary school in a manner that is exciting, creative and rigorous. To accomplish this, the candidate will formulate a personal framework based on both a historical/philosophical perspective as well as from knowledge of the state and national frameworks and other reform documents. Using this knowledge as a framework, he (she) will learn to apply multiple strategies and resources for the development of unit plans, instructional delivery and assessments that utilize a student-centered, inquiry (problem-solving) and community based approach to the teaching of science for all students.

Course Objectives:

I.e. the student will gain a broad perspective and practice in using.....

- 1) The major frameworks, programs and standards for Science Education in California and the United States
- 2) The history and philosophy of science
- 3) Diverse resources, materials available for science education including texts, lab manuals as well as technological and community related resources
- 4) Methods of safe and effective science teaching
- 5) Methods of integrating technology into science teaching,

- 6) Effective methods in expository teaching; inquiry based learning; the use of open-ended laboratory experiences; community or field based science
- 7) Effective and diverse assessments including both formative/summative authentic and traditional; application of action research
- 8) Enrichment activities that involve students in applying science and go beyond the standard curriculum
- 9) Strategies of planning of science curricula as well as specific strategies for the integration of other disciplines (interdisciplinary curriculum).
- 10) Inclusive science education strategies including SDAIE that enhance the science curriculum for all learners.

Teacher Performance Expectation (TPE) Competencies:

This course is designed to help teachers seeking the Single Subject Credential to develop the skills, knowledge, and attitudes necessary to assist schools and district in implementing an effective program 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. The following TPE is addressed in this course:
TPE 1B: Subject specific pedagogical skills

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>

Required Texts:

Science Instruction in the Middle and High School (Chiappetta and Koballa) (2009 7th Edition) available in bookstore

Use of Discrepant Events for K-12 Science Teachers (Aztec Press /University Bookstore), (Keating) available in bookstore only

California Frameworks in Science (State Dept of Education) under <http://www.cde.ca.gov/re/pn/fd/documents/science-framework-pt1.pdf> (see free downloads)

Inclusion of All Students (Choate) Used in other courses already

Optional Texts:

- The Demon Haunted World (Sagan)
- The Structure of Scientific Revolutions (Kuhn)
- California Safety Manual in Science (State Dept. of Education)
- Flinn Scientific Safety Manual (both available as free downloads)

Schedule: Classes will consist of formal class meetings, field trips, video conferences and independent study totaling approximately 20 seminars @ 10 seminars per semester @ 3.0 hrs.each from 5:30-8:30

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)

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

College of Education 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. Should the student have extenuating circumstances, s/he should contact the instructor as soon as possible. *(Adopted by the COE Governance Community, December, 1997).*

Both attendance and punctuality are essential to completing all work satisfactorily. Only 50% of the potential value for an assignment can be credited as makeup for an assignment that is due and reviewed in a class that was not attended by the student. Two absences in one semester can result in a minimum of one grade lower; three absences can result in a non-passing grade (unless there are extenuating circumstances). Late arrivals will be penalized at the discretion of the instructor.

Students with Disabilities Requiring Reasonable Accommodations

Students with disabilities who require reasonable accommodations must be approved for services by providing appropriate and recent documentation to the Office of Disable Student Services (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.

All University Writing Requirement: A minimum of 2500 words of writing assignments per semester are required. This will be fulfilled through a variety of ways in

this course such as : reading logs, action research reports, field trip curriculum plans, discrepant event curriculum plans and independent study reports.

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 presentation 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.”

Incidents of Academic Dishonesty will be reported to the Dean of Students. Sanctions at the University level may include suspension or expulsion from the University.

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.

Course Requirements: See Description of Assignments (p7-14)

Grading Standards: See grade sheet and point values of all assignments (p7-14)

Course Schedule and Outline:

Fall Semester EDSS 545 A:

*=Assignment/Reading due (bold)

#1 September 29 (Tuesday 530-830 UH 439) Video Conference (with assistance of Andy Corman)

- Class introductions
- ***Read syllabus (p1-15 only) prior to class with special attention to the following: 1) copy fall semester grade sheet addendum A (p14); 2) assignments required (p7); 3) description of each assignment (p7-14). BRING ANY QUESTIONS TO CLASS**
- Prior to class be prepared to respond to these questions: **How would you define Science as a discipline? How should it be taught in high school? What do you think is important for you to learn this year?**
- **Review Assignments for Next time:** (to be discussed in class);
 - 1) Format procedure for Reading Logs for text reading assignments (questions for discussion TBA)
 - 2) Reading logs and chapter questions (TBA) from Text (Ch 1 “Thoughts and Actions of Beginning Science Teachers and Ch 2 “The Purpose of Science Teaching”)

#2 October 6 (Tuesday 5:30-8:30 UH 460)

- Introduction to inquiry based science through the discrepant event (DE) model with in class presentation “Bouncing Balls” (What are the basic pedagogical elements of an effective DE?)
- Discussion of Science Frameworks and Standards Jigsaw Assignment* #3 a-c and preparation time in class
- *** Discussion of /Reading Logs and Questions from Text Ch 1-2**
Review Assignments for Next time:
 - 1) Read and prepare reading logs and chapter questions (TBA) for Ch 3 “Planning to Teach Science” and Ch 4 “Teaching Science”
 - 2) Prepare group presentation of Science frameworks and standards jigsaw
 - 3) Assign up for DE and Prepare DE (if scheduled)

#3-#4 October 10 (Saturday 900-300 UH 460)

- ***Discrepant Events (four presenters) #6 a-b**
- ***The use of Inquiry Based/Open ended vs. Closed ended science lab experiments “Paper Towel Experiment” (in class)**
- **Presentation of Jigsaw of science frameworks and standards assignment (#3a-c)**
- **Discussion of reading logs and questions from Ch 3-4**
- **Discussion of Science Teacher Observation Study #9 A and B**
- **Discussion of Case Study Assignment: Overview of Issues in Student Teaching Assignment #15 (also see Addendum C in Syllabus for Case Study Model)**
Review Assignments for Next Time:

- 1) Read and prepare reading logs and chapter questions (TBA) for Ch 5 “Managing the Science Learning Environment”, Ch 6 “Assessing Science Lessons” and Ch 7 “The Nature of Science”
- 2) Prepare DE (if scheduled)
- 3) Completion of Science Teacher Observation study

#5 October 13 (Tuesday 5:30-8:30 UH 460)

- ***Discrepant Events (two presenters) #6 a-b**
- *** Discussion of /Reading logs and Questions in Text (Chap 5,6,7 due)* #2**
- ***Discussion of findings and final report from the Science Teacher Observation Study #9 A and B**
- **Review Assignments for next time (November 10):**
 - 1) Reading logs and chapter questions (TBA) for Ch 10 (“Inquiry and Teaching Science”)
 - 2) Prepare DE for Class #7 (if scheduled)
 - 3) Prepare Case Study proposed “issue” for discussion in Class #7

#6 Independent Study (Assignment #10): No formal meeting Sometime between October 13-November 10 or whenever scheduled by you. To be completed before class #8 during this semester

Assignment #12: attend a science related informal 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. Your choice!! To complete this requirement: 1) complete a one-page summary with applications to teaching; 2) send by email to all of us; 3) do a 1-2 minute overview/ presentation to the class during class #8. The report and oral presentation should include a summary of what you learned and implications for your own teaching.

#7 November 10 (Tuesday 5:30-8:30) Video Conference in UH 460

- ***Discrepant event presentations (two presenters)* #6 a-b**
- *** Discussion of /Reading logs chapter questions for (Ch 10)* #2**
- **Guest Speaker: Traves O'Neill (High School Physics teacher and former CSUSM Single Subject student) “Action Research Study on Inquiry Based Science”**
- **Discussion of proposed Case Study “issues”**

Review Assignments for Next time: Go over assignments for next three classes:

- 1) WAP Field Trip #13 (Class #9-10)
- 2) Application of these resources: Science safety manual (CA); Flinn safety manual and Ch 14 “Science Safety in the Laboratory and Classroom” (read/notes/questions) for the development of a Personal Plan for Science Safety assignment #8; (Class #8)
- 3) Prepare the final Case Study report (Assignment #15) for some issue(s) during beginning student teaching (see Addendum C in Syllabus for Case Study format due during the field trip to the WAP).

8 December 1 (Tuesday 5:30-8:30)

- *** Overview of Science Safety with discussion/questions from 1) Science Safety Manual or Flinn Scientific; 2) Ch 14 text; and 3) Discussion of safety issues with master teacher #9b**
- ***Discrepant event presentations (two presenters)* #6 a-b**
- ***Presentation of Personal Plan for Science Safety #8**
- **Discussion of preliminary progress of issues in student teacher for *Case study preliminary action plan findings #15 (Addendum C model)**
- ***Overview of Independent Study Assignment (#12)**

Review Assignments for Next Time:

- 1) Discuss_Second semester schedule
- 2) Field trip agenda and handouts
- 3) Final Case study action plan reports (#15) due at WAP

#9-10 December 5 (Saturday 9-3 at Wild Animal Park) Assignment #13

- Issues in organizing a field trip
- Resources available at park and for school sites
- Implementation and analysis of grade level WAP curriculum guides (in class)
- Strategies/implementation plans for doing animal observation studies (in class)
- Instructor Evaluations
- ***Presentation of Final written Case Study Reports**

Overview of Assignments (by number)/Requirements: (each will count as the points noted). The final grade for part a and b will be the % of total points earned that semester converted to a letter grade (90-100=A etc.) Assignments are due on time and will not be accepted late.

- 1) Attendance/participation (5 pt. per class) (50 pts. per semester.)
- 2) Science Methods Text Readings/Questions/Discussion/Notes (6pts each)
- 3) Jigsaw of science frameworks and standards (10pts)
- 4) Evaluation sheets on best practices in Science video's (5 pts)
- 5) Evaluation of Science Internet sites (5 pts)
- 6) A-B Inquiry---Discrepant event reflection/ presentation(s) (15 pts)
- 7) Science lab SDAIE modification and action research findings (20 pts)
- 8) Development of an outline for a Plan for Science Safety (10 pts)
- 9) A-B Observation of science lesson and evaluation of science safety strategies (10 + 5 pts = 15 pts.)
- 10) Development and implementation of authentic assessment and comparison to traditional assessment (action research findings) (20 pts)
- 11) Book Report on high interest science book (5 pts.)
- 12) Independent Study Open ended science related event both semesters (10 @ 2 =20 pts)
- 13) Strategies for implementing field trips at the high school level (WAP visit and Reuben Fleet Museum 2@ 15 pts = 30 pts.

- 14) Researching and presenting a mini-lecture on a current topic in science (10pts)
- 15) Two Case Studies one per semester: Issues in student teaching and proposed action plans =(10 +10=20 pts @2 =40.)

Optional/Extra credit: (maximum 10 pts)

- 1) Directorship (5 pts.)
- 2) SDSEA or CSTA or NSTA or other Conference in addition to open assignments (5 pts. one day)

Point's summary:

Fall Semester required: Assignments #1 (50 pts); #2 (54 pts); #3 (10 pts); #6 (15 pts); #8 (10 pts) #9 a-b (10+5); #12 (10 pts); #13 (15 pts); #15 (20 pts); = 198 pts. Total

Description of all Assignments (by number):

Assignment 1 Attendance (each class counts 5 points) In the event of an absence any assignments due that night could receive only 50 % of the potential credit (if made up) since you were not there to interact and discuss the assignment.

Assignment 2 Science readings in texts (6 points each chapter) Each chapter is assigned a value of six points that includes your notes or a prompt (summary of major points, reflections, questions) and responses to specific chapter questions as well as a discussion of these with your colleagues in class.

Assignment 3 – California Science Framework and Standards (10 pts)

Spirit of the assignment: How to teach science to all students by understanding how to apply standards to an inquiry based curriculum appropriate to a subject area to read a portion of the California Science Framework and the Standard for a particular science subject area for grades 9-12. You will write your individual response to the readings. Then you will work with your subject level team to prepare and do a presentation to the class. It's important that you do the reading and the write-ups BEFORE you meet with your team.

- 3a **Framework summary response** 3 points
- Individually: Read the California Science Framework. For the standards chapters read only the subject area standards for high school subject area (9-12) that you are assigned i.e. Physical Science, or Life Science or Earth Science Think about the readings holistically.
 - Write about a page for the non-standards chapters, in your own words, that answer 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, and have a question about (or) which you disagreed?
- 3b **Science subject standards response (only your subject area)** 2 points

- Using the standard for your chosen subject, (assume a general course) pick one standard from physical science, or life science, and or earth science. 1) Choose and write the standard; 2) come up with a brief description of an activity those students in that subject area can do and 3) state which Investigation and Experimentation standard it address for that subject.
- In addition, 4) write a short paragraph on how this lesson might incorporate other ideas discussed in other chapters in the California Frameworks. For example, one chapter addresses the use of technology in science. Your lesson might incorporate the use of a remote data recorder for pH in a stream environment and using this data to graph the outcomes on a computer. You might have to receive professional development training (another chapter in Frameworks) to learn how to use the remote data recorder and the graphing software. Both of these ideas might be addressed in this section

3c. Team preparation and presentation 5 points

- Get together with your team by subject area (chemistry, physics, biology or earth science). Look at the activities that everyone wrote up for Assignment 2b. Choose one that your team feels is the best representation of the application of the standards/frameworks
- As a team, write up a lesson plan for the activity stating the standard(s) (with objectives, activities, assessment,). This lesson plan should also try to integrate the ideas from the individual team chapters 4-11 as discussed in 3b above. Put it on chart paper or an overhead transparency so it can be easily presented to the class.
- As a team, think about the entire set of standards for the subject area. If you only had time, as a teacher, to do half of it with your students, which half would you do, and why? Make a list to present to the class, and be prepared to give your reasons for your choices.
- In 8 minutes or less, present your creative lesson plan and standards choices. Be prepared to explain why your science lesson plan represents a standards based, student centered, inquiry based concept and why your chose the particular lines or sections from the standards to teach.

Assignments 4 and 5 (Evaluation and Use of Technology Resources)

Assignment 4 (Internet Sites) (5pts);

Assignment 5 (Best Practices in Science Videos) (5pts)

Spirit of the Assignments: individually explore Internet and video science resources; rate them and provide feedback to classmates regarding their potential use.

For assignment #4 explore in detail at least three internet sites; for assignment #5 explore either the Annenberg and (or) the Lucas internet site for Best Practices in Science

Teaching and one video/DVD resource and prepare the following for each (three in all):

- 1) Name/ access information (so someone else can access)
- 2) Rating 1-5 with justification for use by teacher, student (appropriateness for what subject or level)
- 3) How would you use it

- 4) Electronic documentation so the technology director can collect and send complete copies to all

Assignment 6: Inquiry based Discrepant Event Presentation (15 pts)

Spirit of the Assignment: to develop and teach a particular kind of a science inquiry lesson that teaches both sciences thought processes and science content. You will practice your discrepant event on at least middle or high school age student and reflect on the child's responses and what they indicate about how much he/she understood. Working by yourself you will actually present your discrepant event to the class and give a copy of the lesson plan to each class member.

- 6a. **Discrepant Event Lesson Plan and Presentation** 10 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.
 - Do your discrepant event with at least one middle or high school age student and take careful notes and prepare a written journal report on the student's response (Assignment #6B)
 - Present your DE to the class. (You may discuss your findings from the pre-event DE with the student as part of this presentation. You are limited to 15 minutes presentation time.
 - After presenting your event, give a copy of the DE lesson plan to each member of the class your individual written journal to the instructor (see 6B)
- 6b. **Discrepant event journal (Reflection on Pre-Event)** 5 points
- After you have done your pre-event discrepant event with a student, 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 journal report that describes what happened, with special attention to the following: what the student said and did. Analyze the student's response: what portions of the event did the student understand (not understand) what was happening? Did they understand the underlying science concept? What modifications to what you say or do might be necessary for better understanding?

Assignment 7: Science Lab (SDAIE) modification using the action research model (20 pts)

Spirit of the Assignment: take an existing science lab or activity and rewrite it to be more appropriate particularly by second language learners (use SDAIE techniques). Evaluate using the action research model by comparing outcomes of experimental lab (SDAIE) with control (original lab or activity). See suggested for ideas in Choate Ch 13.

For the assignment: Use the SDAIE lab or activity you have prepared and incorporate it into a class during advanced student teaching and compare it to outcomes from a control class using the original lab or activity (10 pts total). For your presentation: 1) bring overhead copy of original science lab or activity and revised SDAIE lab (6pts); 2) List of changes/ adaptations you made (4pts); 3) Design an action research proposal using the design explained in class. This will be presented prior to implementation in class for input from classmates and instructor (5pts). 4) Present the findings (triangulated data) by comparing various outcomes from the two lab classes one, which used original lab (control) and another who used the modified SDAIE lab (experimental). Some tools for measuring the success (lack of success) of the lab approaches might be: teacher observations, focus groups, and student assessment of understanding, Quickwrite and class discussions. Discuss briefly your findings (5 pts).

Assignment 8 Development of a personal Plan for Science Safety (10 pts)

Spirit of the Assignment: Use your readings from the safety manuals/documents and interview with the science teacher to propose an outline of a **Plan for Science Safety** that you will (can) use within your science discipline. This might include: safety contracts, demonstrations, laboratory protocols, etc.

Assignment 9 a-b Observation of science lesson and teaching strategies and use of science safety within the curriculum (10 + 5 pts= 15 pts)

Spirit of the assignment: to intelligently observe a science lesson. During your observation/participation time you will find a science teacher who may or may not be your own master teacher. You will 1) 9A: interview the teacher before and after the lesson. If possible, it's good to also talk with some of the students after the lesson (see guidelines for 9a below (10 pts); 2) 9B: address with the teacher the specifics of how she (he) approaches science safety. This might include as a minimum: lesson plans they use to teach safety, lab safety contract, general rules used, and any general experiences in dealing with science safety). Collect samples if you can and include what you would do in your classroom to address science safety (5 pts). You will put both of these responses (9A-B) together with your own observations and conclusions to write your report.

General guidelines for completing 9 a (10 pts):

GENERAL INFORMATION: grade level, district, description of the activity.

BEFORE (Interview)

- How did the teacher come to do this lesson?
- How did he/she pick the topic?
- Where did the materials come from?
- In general, how does the teacher think the students will respond to the lesson?
- Identify some students in the class who will like this lesson and do well on it.
- Identify some students who might have difficulty, either cognitive or behavioral and describe the problems they are likely to have and how the teacher might adapt for them

DURING (observation)

- Is there a written or unwritten plan for this lesson?
- What are the objectives (if this/these are unstated, you will have to figure them out)
- How does the teacher know that the objectives were met at the end of the lesson (formative or summative assessments)?
- How does the teacher know as the lesson is going on whether the students are getting it? (Formative i.e. checking for understanding)
- Does the teacher make any adaptations to address the needs of the children who have difficulty?
- Can you clearly follow the procedures the teacher is using and the understanding of the science concept and do they relate directly to the objectives?

AFTER (interview teacher, and if possible, some students)

- How did the lesson go?
- Did the teacher correctly predict the performance of specific students?
- Did the adaptations (if there were any) work?
- How about the class as a whole – were the students engaged?
- Did they learn the skills and or content?
- How does the teacher know whether they got it or not?
- Were there any logistical problems?

If you taught this lesson, how would you change it? (Include as many things as you can think of. Even if the lesson was wonderful, come up with at least one modification of your own.) Remember, there is no such thing as a perfect lesson.

General Guidelines for completing 9B (5pts) (Science Safety in the Science Curriculum)

Address with the teacher the specifics of how she (he) approaches science safety. This might include as a minimum: lesson plans they use to teach safety, lab safety contract, general rules used, and any general experiences in dealing with science safety). Collect samples to include if 9B and include your own comments on what you would do (5 pts).

Assignment #10: Comparison of the use of authentic assessment vs. traditional assessments in Science using the Action Research model (20 pts)

Spirit of the assignment: During advanced student teaching prepare both an authentic and traditional assessment (that address the same standards and science content) and include their rubrics and implement them in an actual science lesson. Design an action research plan to evaluate the findings comparing two classes (control and experimental). Describe the strengths and challenges that you found in using this as an assessment.

For this assignment be prepared to discuss and include as part of the discussion: 1) a copy of the actual lesson plan; 2) a copy of the two types of assessments and rubrics you used (with student outcome examples if possible) (10 pts); 3) action research design proposal that incorporates at three instruments (triangulation) (5pts) 4) the triangulated findings/outcomes (data) comparing the two assessment approaches that include a brief overview of the findings as well as the strengths and challenges of using these instruments (for the teacher as well as for the student) (5pts)

Assignment 11 Book Report on high interest science book (5 pts.)

Spirit of the assignment: read a new book in fiction or non-fiction that you would like to read for general interest, deep background or for inclusion in your own class. By reading yourself you increase the likelihood that you will include science reading as part of the curriculum for your own students. Share this electronically with your classmates.

For this assignment read, summarize, rate (1-5 with justification) and make recommendations on how you might incorporate into your teaching either directly indirectly. Share this formal review electronically with instructor and classmates as well as during the general class discussion.

Assignment 12 Attendance at a formal or informal science event, presentation or site (10 pts each semester 20 pts in all)

Spirit of the assignment: by attending formal or informal outside events a science teacher is more likely to encourage their own students to seek out such events and include them as part of their curriculum. After having completed assignment # 12 write up a brief report summarizing it and how you might use it in your teaching 1) do a 1-2 minute presentation in class and 2) send an electronic copy to all via email.

Assignment 13 Attendance at a field trip to the Wild Animal Park (Fall 15 pts) and Reuben Fleet Science Museum (Spring 15 pts)

Spirit of the assignment: by attending this field trip students will: 1) general procedures for planning an implementing a field trip in science; 2) how to access and use resources provided by a site prior to going; 3) Pre, during and post lesson plans using a) prepared curricular materials at a field site; b) teacher developed and implemented curricular plans

Assignment #14 Researching a current issue or topic in science and presenting a mini-lecture in class on that topic (15 pts).

The spirit of the assignment is to practice researching a current issue or topic (outside the science textbook) and applying some of the concepts from Chapter 11 (Using lectures in science) to present a 10-minute mini-lecture to the class.

Assignment #15 Issues in Science Student Teaching (Case Study Approach): both semesters (20 pts each semester)

The spirit of the assignment: Share issues/ problems/solutions to various scenarios that occur during beginning and advanced student teaching related to curriculum, teaching strategies and classroom management. The Case Study Model used will be discussed in class and used as an approach to address real solutions and subsequent outcomes from these action plans. One written Case Study will be required each semester. (10 +10=20 pts @2 =40.)

See Addendums A (Fall Semester Grade Sheet); B (Action Research Design Proposal Spring Only); C (Case Study Final Report Form Both Semesters)

Grade Sheet for Fall Semester (please copy for grade folder) Addendum A

**EDSS 545 A Fall Semester
Grade Sheet**

Name

Assignment Number/Name

#1 Attendance (5pts each class) indicate nights absent by date

(50 pts possible)

#2 Science text reading logs and chapter questions (6pts each) indicate scores on each chapter assigned below)

Ch 1_ 2_3_4_5_6_7_10_14_
(54pts)

#3 California Frameworks/Standards (5 pts + 5pts)

Individual report

Group Presentation

#6 Inquiry based lesson (Discrepant Event) 15 pts

Presentation (10)

Reflection (pre-event) (5)

#8 Personal Outline plan for Science Safety (10pts)

#9A/B Observation of Science Lesson/Safety Report (10pts + 5 pts)

12 Independent Study at formal or informal science event (Report) 10 Pts

#13 Attendance and Report on Science Field Trip (15 pts)

#15 Issues in Science Teaching (Case Study Approach)(20 pts)

Total Possible= 198 pts

Points Earned=

Average/Grade=

Addendum C (Case Study Preliminary and Final Report)

Case Study Considerations for Assignment #15 Issues in Student Teaching

A case study is a formal strategy to collaboratively problem solve some issue in education (in this case science education). Some generalized steps should include at a minimum at least the following preliminary steps leading to a final report:

- 1) **Identify a problem** which is inhibiting your ability to teach or the students' ability to learn. *It may take many forms such as: infrastructure: I room is too small to have laboratory type exercises; management: one of my students will not do any homework; teaching materials: I have no lab manuals and little materials; teaching strategies: I do not know how to deal academically with such a wide range of abilities in my class. ETC.*
- 2) **Brainstorm possible solutions** based on general knowledge from classes, readings, master teachers and prior experiences. After you have discussed the issue with your partner and instructor get feedback and suggestions from them. *Ex. From infrastructure problem: swap rooms with another science teacher one day a week when they are not using the lab. This should be coordinated with the principal and based on state mandated requirements for safety in science laboratories*
- 3) **Propose an action plan with specific actions and a timeline**
For three weeks with plenty of warning to the students change rooms to use the lab. Identify additional problems this may create and propose changes.
- 4) **Gather data from observations and responses to your plan**
Students took an extra five minutes to get to this lab so I said if they were on time this would result in a bonus of 5 pts on their lab report for at least the first three weeks.
- 5) **Final Report should include aspects of 1-4 in addition to the outcomes and implications** from the action plan: What were the successes and the challenges to the plan? What would you do next to improve on it?

I would request an adequate lab space from the principal or whoever schedules a year prior. I would make a recommendation on which room might be a good fit for my curriculum and point out the state requirement for adequate space and safety for laboratory based science classes.

Spring Semester: (specific dates will be determined by end of fall semester. Dates on this syllabus are from last year and are approximate). Topics may be adjusted and adapted also.

The following are assignments due this spring semester that could be completed prior to first class or during the intercession:

- ***Internet resources #4 Note: We will focus on the International Polar Year (IPY) resources for this assignment. I have sent out an email with 3 relevant sites with many links from there.** (please review three sites and include an evaluation that includes at least the following: 1) copies of URL and a representative page; 2) justifiable rating and rationale (1-5); 3) applicable to you as a teacher or your students; (i.e. how would you use it)?
- ***Video resources #5 from one educational source and one television show (Annenberg (<http://www.learner.org/resources/series126.html#>)/Lucas) bring and discuss one resource from above 1) strengths and weaknesses; 2) rating and rationale (1-5) 3) potential application to science classroom**
- **Science related personal reading #11** send title, other information including short summary/application and personal rating/review (due anytime during the semester) Discussion in class.
- **Reading Assignments: Ch_11, 8 , 13, 12 and 15 (In this order)**

#1 January _ (Monday)

- Review syllabus for second semester
- *Discussion of assignment regarding ratings of video resources #5 and internet resources #4
- Antarctica (IPY) Pre-service Teacher Project (Live Video Feeds)
- **Next time:**
- Reading log Ch 11 (Lecture): Prompt: Which of these ideas will I incorporate in my 10 minute lecture on February 11?
- Prepare mini lecture as part of a small unit on current topic in Antarctica Research for next time (aligned with Ch 11 Lecture Strategy) Assignment #14
- Presentation/Handout of ratings of video resources #5 and internet resources #4

#2 February _ (Monday)

- Discussion of Ch 11 (Lectures)
- Presentation of lesson on current topic in science using mini-lecture approach (10 minute max) (aligned with Ch 11 Lecture Strategy) Assignment #14
- **Discussion of three Best Practices in Science Teaching from both Annenberg and Lucas Web site resources include inquiry based teaching in for # 5 and #4 Internet sites:** bring and discuss 1) strengths and weaknesses; 2) rating and rationale (1-5) 3) potential application to your science classroom

Review Assignments for Next class:

1) Reading prompt to respond for Ch_8 in Science Instruction and Ch 12 Successful Inclusive Teaching (SDAIE Science by Choate): **As a result of reading this: What are some specific strategies you would (have) use to adapt learning in your science classroom (be specific)?**

#3 February _ (Monday)

- Discussion of reading response to prompt from Ch 8 Diversity in Science Instruction and Ch 12 (Choate) (SDAIE instruction in Science)
- Overview of findings from Keating dissertation on Navajo related to SDAIE techniques
- Review of Inquiry based topics (DE/Open ended experiments) with an introduction to curricular and extracurricular science projects: Odyssey of the Mind/ Invention Convention/Toys in Space as additional models of Inquiry based learning

Review assignments for next class:

- 1) Adapt Science lab with SDAIE adaptation (experimental). Be prepared with an overhead of both control and experimental lab write-ups next time with appropriate SDAIE modifications; 2) Use action research proposal form (sent via email) to discuss your research design on: Effectiveness of SDAIE techniques in science lab settings (**See Assignment # 7 description in the syllabus**). Your **final report** research report will include: 1) copies of both experimental and control lab directions; 2) findings from the action research design (**Final action research findings due on April 14**)
- 2) Reading log response from Chapter 13 Laboratory and Field work : Prompt: (Discuss a range of ways that you have or will use laboratory and field experiences in your science classroom)

#4 March _ (Monday)

- Present preliminary experimental (SDAIE) and control science lab instruments and Action Research Proposal that will be used in conjunction with Assignment #7 : Effectiveness of SDAIE techniques in science lab settings
- Discussion of reading prompts from Ch 13 Laboratory and Field Work
- Discussion of Assignment #10: Effectiveness of Applying Authentic Assessments to a Science Classroom

Review assignments for next class:

- 1) Read/Reading log prompt for Ch 12 Science Technology and Society (Integrating Science as a Discipline) and Ch 15 Use of Technology in Science: Based on the content of these two chapters: Discuss the range of technology you would use or have used (or seen) in the science classroom (Be specific)
- 2) Choose one award winning digital lesson plan from your subject area (middle or high school level) from this NSTA web site and give us an overview as well as any recommendations (may be done in teams by subject areas i.e. ES, PS, CS, LS. <http://www.nsta.org/publications/interactive/laptop/grade.htm>)
- 3) Assignment #10 (**See description in syllabus**): Applying Authentic Assessments to a Science Classroom. As part of the student teaching experience: you will design and use an authentic assessment and compare its effectiveness with a more traditional assessment (action research) for the same lesson (ie a control and experimental design). Note: For next class bring 1) both the authentic instrument (experimental) and traditional instrument (control) and the rubric to score them as well as the 2)

action research proposal form (sent via email) that you plan on using in your action research study. **Your final** report will include: 1) copy of lesson plan used, 2) both forms of assessment instruments and rubrics used and 3) findings from this action research design. **Final Action Research Report due May 5**

- 4) Read Ch 19 in Science Instruction (pp 266-71 only) to assist in develop of authentic assessment instrument and scoring rubric

**#5-#6 March Field Trip to a Formal Museum site (Reuben Fleet/ Natural History):
Use of Community Resources in the Curriculum (Assignment #13 Part 2)**

- Educational Resources at both museums
- Design a pre/ during/post lesson with specifics logistics and assessments for one of the demonstrations at Reuben Fleet followed by modeling at the location for the class (final written design made available to all via email)
- Design a pre/ during/post lesson with specifics logistics and assessments for one of the demonstrations at Natural History Museum followed by modeling at the location for the class (final written design made available to all via email)
- After viewing one of the available movies at the site: How would connect it to the curriculum and how would you make students accountable for material seen in movie? (written response made available via email)

#7 March (Monday)

- Issues in Science Student teaching (development of Case Study 2 Issue(s) (#15)
- Presentation of instruments/ rubrics for (traditional and authentic assessments) and action research proposal that you will use in conjunction with Assignment #10 (Effectiveness of Authentic Vs Traditional Assessments in a Science Classroom)
- Discussion of reading prompt from Ch 12 Science Technology and Society and Ch 15 Use of Technology (Discuss the range of technology you would use or have used in the science classroom (Be specific)
- Discussion of NSTA digital lesson plan (each student or subject area presents)
- Book report due /Discussion in Class Assignment # 11

Review assignments due for next class:

- Presentation of Action Research findings on: Effectiveness of SDAIE techniques in science lab settings (#7);
- Using a dyad model provide feedback to Case Study Issues with recommendations for action plan

#8 April _ (Monday)

- Issues in Science Student Teaching preliminary report (Share discussions and recommendations from partner as part of #15 (**note send to me via email prior to class**))
- Final Action Research Findings on: Effectiveness of SDAIE techniques in science lab settings (#7). **Note requirement on syllabus; (note send final written report to me via email prior to class)**

Review assignments for next class:

- Independent Study/Open date assignment (#12)
- Case Study Final Report (#15)
- Discussion of High interest science related book reports #11 (overview of already emailed reviews)
- Present Findings from Assignment #10 Effectiveness of Authentic Vs Traditional Assessments in a Science Classroom
-

#9 May _ (Monday)

- Case Study oral report (# 15) (Final Written Report Due by May 15th)
- Independent Study/Open date assignment (#12)
- Report Final Findings from Assignment #10 Effectiveness of Authentic Vs Traditional Assessments in a Science Classroom (**Note requirements on syllabus**)
- Instructor Evaluations (**Please send final report to me prior to class**)
- TPE #1B Subject matter pedagogical application due May 12

#10 Independent Study (Assignment #12) (description due as email attachment by May 5)

Note: some of the assigned time for the class will be in the nature of a Practicum/research assignment during student teaching or observation/participation (at site). More specifically time is allotted outside of formal class meetings for the following field assignments as outlined in the syllabus (theory to practice): 1) Case Study 2 ; 2) Effectiveness of SDAIE Science lab modification vs. a control and; 3) Effectiveness of authentic vs. traditional assessment in science setting.

Assignments (by number)/Requirements: (each will count as the points noted). The final grade for part a and b will be the % of total points earned that semester converted to a letter grade (90-100=A etc.) Assignments are due on time and will not be accepted late.

- 1) Attendance/participation (5 pt. per class) (100 pts.)
- 2) Science Methods Text Readings/Questions/Discussion/Notes (6pts each)
- 3) Jigsaw of science frameworks and standards (10pts)
- 4) Evaluation sheets on best practices in Science video's (5 pts)
- 5) Evaluation of Science Internet sites (5 pts)
- 6) A-B Inquiry---Discrepant event reflection/ presentation(s) (10 pts)
- 7) Science lab SDAIE modification and action research findings (20 pts)
- 8) Development of an outline for a Plan for Science Safety (10 pts)
- 9) A-B Observation of science lesson and evaluation of science safety strategies (10 + 5 pts = 15 pts.)
- 10) Development and implementation of authentic assessment and comparison to traditional assessment (action research findings) (20 pts)
- 11) Book Report on high interest science book (5 pts.)
- 12) Open ended science related event both semesters (10 @ 2 =20 pts)
- 13) Strategies for implementing field trips at the high school level (WAP visit and Reuben Fleet Museum 2@ 15 pts = 30 pts.

- 14) Researching and presenting a mini-lecture on a current topic in science(10pts)
- 15) Two Case Studies one per semester: Issues in student teaching and proposed action plans =(5 +5=10 pts @2 =20.)

Optional/Extra credit: (maximum 10 pts)

- 1) Directorship (5 pts.)
- 2) SDSEA or CSTA or NSTA or other Conference in addition to open assignments (5 pts. one day)

Point's summary:

Spring Semester: Assignments #1 (50 pts); # 2 (42pts.); #4 (5 pts.); #5 (5 pts.); #7 (10+10=20 pts.); #10 (10+10=20 pts.); #11 (5 pts.); #12 (10 pts.); #13 (20pts); #14 (10 pts); #15 (10 pts) = 197 pts. Total

Addendum A (Spring Grade Sheet)

EDSS 545 B Spring Semester Grade Sheet

Name

Assignment Number/Name

#1 Attendance (5pts each class) indicate nights absent by date (50 pts possible)

#2 Science text reading logs (3pts each) indicate scores on each chapter assigned below)

#4 Investigation and evaluations of three internet sites 5pts

#5 Investigation of Video resources (Internet/TV) 5pts

#7 Action Research Study on Effectiveness of SDAIE vs. Traditional Lab Experiences (10+ 10= 20 pts)

- Preliminary Proposals
- Final Written and oral report of findings

#10 Action Research Study on Effectiveness of Authentic vs. Traditional Assessments (10+10= 20 pts)

- Preliminary Proposals
- Final Written and oral report of findings

#11 Book Report on high interest science book (10 pts)

12 Independent Study at formal or informal science event (Report) 10 Pts

#13 Attendance and Reports on Science Field Trip (15 pts)

Reuben Fleet Natural History Movie

#14 Mini-Lecture as introduction to science topic (10 pts)

#15 Issues in Science Teaching (Case Study Approach)(10 pts)

Total Possible= 171 pts

Points Earned=

Average/Grade=

Addendum B (Action Research Design Proposal/Final Report)

Action Research Project Design Proposal Plan

Purpose:

- 1) To apply the principles of action research in a teacher directed and designed project.
- 2) To model the concept of the teacher as a researcher.

Design Plan

Problem: (specifically what question(s) are you posing)

Information: (what are potential sources of background information related to your question(s). This literature review of your topic can assist you in more formally organizing both your questions and as a basis for formulating your research design. Although it is not part formally a part of this assignment to include this you have done a lot of informal background reading and discussion to inform you related to this topic.

Hypothesis: (based on background information and what do you predict will be the answer to the question). This may be stated in the form of a null hypothesis (ex. there will be no difference between method A and B in learning science concepts) or research question format (ex. students will learn science concepts better when using method A). Remember it is not so important that the data supports or refutes the hypothesis but rather that it (data) accurately justifies your conclusions.

Experimental Design: This section should include an overview describing **the nature of the type of research study** i.e. quantitative, qualitative (or both) as well as the general procedures which will guide you such as: any materials, instruments and

techniques utilized to **gather data**; the **subjects** which will be the focus of the study; **time frame** for conducting the study; and methods used to **analyze data**. Remember to explain how you will attempt to control the critical variable of researcher effect with **triangulation techniques** (since in many cases you will be both the teacher and the researcher).

Data/Results: How will the data be represented? For example, will a journal be used, data tables constructed and or graphs produced? If statistical analysis, please specify.

Conclusions: Is the analysis of your data support , refute (or yield inconclusive results) related to your hypothesis? What inferences could you draw from the conclusions? What additional questions and research might your results suggest? What potential implications might your findings suggest (for your classroom or for learning and teaching in general)?

Addendum C (Case Study Preliminary and Final Report)

Case Study Considerations for Assignment #15 Issues in Student Teaching

A case study is a formal strategy to collaboratively problem solve some issue in education (in this case science education). Some generalized steps should include at a minimum at least the following preliminary steps leading to a final report:

- 6) **Identify a problem** which is inhibiting your ability to teach or the students' ability to learn. *It may take many forms such as: infrastructure: I room is too small to have laboratory type exercises; management: one of my students will not do any homework; teaching materials: I have no lab manuals and little materials; teaching strategies: I do not know how to deal academically with such a wide range of abilities in my class. ETC.*
- 7) **Brainstorm possible solutions** based on general knowledge from classes, readings, master teachers and prior experiences. After you have discussed the issue with your partner and instructor get feedback and suggestions from them. *Ex. From infrastructure problem: swap rooms with another science teacher one day a week when they are not using the lab. This should be coordinated with the principal and based on state mandated requirements for safety in science laboratories*
- 8) **Propose an action plan with specific actions and a timeline**
For three weeks with plenty of warning to the students change rooms to use the lab. Identify additional problems this may create and propose changes.
- 9) **Gather data from observations and responses to your plan**

Students took an extra five minutes to get to this lab so I said if they were on time this would result in a bonus of 5 pts on their lab report for at least the first three weeks.

10) Final Report should include aspects of 1-4 in addition to the outcomes and implications from the action plan: What were the successes and the challenges to the plan? What would you do next to improve on it?

I would request an adequate lab space from the principal or whoever schedules a year prior. I would make a recommendation on which room might be a good fit for my curriculum and point out the state requirement for adequate space and safety for laboratory based science classes.