



SCHOOL OF EDUCATION

Engaging diverse communities through leading and learning for social justice.

333 South Twin Oaks Valley Road, University Hall 468
San Marcos, California 92096-0001
760.750.4300
www.csusm.edu/education

Course Number	EDSS 545B
Course Title	Secondary Science Methods
CRN Number	20653
Days	Thursdays (Some Saturdays)
Time frame of course	10 class meetings
Course Location	University Hall 273, unless noted
Semester / Year	Spring 2016
Instructor	
	Joseph Keating, Ph.D.
Phone	760-5189613 (cell)
E-Mail	jkeating@csusm.edu
Hours	By Appointment

SCHOOL OF EDUCATION MISSION & VISION STATEMENT

(Adopted by SOE Governance Community, January 2013)

Vision

To serve the educational needs of local, regional, and global communities, the School of Education advances innovative practice and leadership by generating, embracing, and promoting equitable and creative solutions.

Mission

The mission of the School of Education community is to collaboratively transform education. We:

- Create community through partnerships
- Promote and foster social justice and educational equity
- Advance innovative, student-centered practices
- Inspire reflective teaching and learning
- Conduct purposeful research
- Serve the School, College, University, and Community

BASIC TENETS OF OUR CONCEPTUAL FRAMEWORK

- Student centered education
- Research and theory specific to the program field inform practice
- Connections and links between coursework and application
- Strong engagement between faculty and candidates
- Co-teaching clinical practice
- Culturally responsive pedagogy and socially just outcomes

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COURSE DESCRIPTION

CSUSM Catalog Description

Secondary Science Education B: Focuses on developing an understanding of theory, methodology, and assessment of Science in integrated and inclusive secondary classrooms: Part B. Prerequisite: EDSS 545A.

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 as well as EDUC 350, EDUC 364, & EDUC 422 or equivalent.

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 (Secondary) Science credential students. Upon completion of this course, the preservice teacher will be able to formulate a basis to teach a 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 of science education 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. This should be in evidence during Clinical Practice 1 and 2 as part of the required Teacher Performance Assessment (TPA). **Classes will consist of formal class meetings, field trips, videoconferences and independent study totaling approximately 20 seminars @ 10 seminars per semester @ 3.0 hrs. Each**

Course Objectives

These objectives will be measured (by utilizing rubrics) through the successful application of the concepts by completion of specific assignments (see descriptions). Prior to completing the assignments, students will be presented with opportunities to discuss effective models and examples, texts and other readings and through discussions both in-class and blogs. The expectation is that they will successfully and seamlessly be able to integrate these applications in clinical practice 1 and 2 (as measured by supervisor's observation as indicated in the teacher performance applications (TPA)).

- 1) The teacher candidate will be able to apply **the major concepts of frameworks and standards in Science Education** to their curriculum based on the California Frameworks in Science, the Next Generation Science Standards (NGSS) as well as the general recommendations for science education indicated by international studies such as Tests of International Science and Math Study (TIMSS);
- 2) The teacher candidate will be able to understand what is learned from the **general history and philosophy of science education** in the United States and how it might apply to current educational practice;
- 3) The teacher candidate will understand and be able to **integrate a variety of diverse resources** appropriate for science education including texts, lab manuals, equipment, **technologies** and both informal and formal community related resources;
- 4) The teacher candidate will be able to apply to the curriculum and their students the **major concepts of safe and effective science teaching and learning** to laboratory and general classroom practices;
- 5) The teacher candidate will be able to effectively **implement the major teacher strategies considered best practices in Science education and differentiate instruction by applying** interactive expository teaching; inquiry-based learning; open-ended laboratory experiences; and the integration of community/ field resources (internships, service-learning and school to career);
- 6) The teacher candidate will be able to appropriately integrate a range of strategies for the integration of a variety of **diverse assessments** including both formative/summative that can be authentic or traditional;

- 7) The teacher candidate will be able to apply the protocols and learning strategies required in **science inquiry-based enrichment activities** such as Science Olympiad, Odyssey of the Mind, Invention Convention, FIRST and Science Fair that extend beyond the standard curriculum;
- 8) The teacher candidate will be able to demonstrate their ability to **integrate the sciences as well as other disciplines** into the standard science curriculum (interdisciplinary curriculum);
- 9) The teacher candidate will be able to **include all students in the curriculum** by applying the major strategies for teaching multicultural, multilingual students (SDAIE/ELL);
- 10) The teacher candidate will be able to identify issues involved in the teaching and learning of science and apply **teacher-designed research designs (action research)** for the ongoing purpose of improving practice.

REQUIRED TEXTS, MATERIALS AND/OR ACCOUNTS

Science Instruction in the Middle and High School (Chiappetta and Koballa) (2014 8th Edition)
Use of Discrepant Events for K-12 Science Teachers (Aztec Press /University Bookstore), (Keating Customized text)
 California Science Safety Manual for K-12 Schools (2012)
<http://www.cde.ca.gov/pd/ca/sc/documents/scisafebk2012.pdf>
 California Frameworks in Science (State Dept. of Education) (see free downloads
<http://www.cde.ca.gov/ci/cr/cf/documents/scienceframework.pdf>
 Next Generation Science Standards (NGSS) Overview and Conceptual Shifts
<http://www.nextgenscience.org/sites/ngss/files/Appendix%20A%20-%204.11.13%20Conceptual%20Shifts%20in%20the%20Next%20Generation%20Science%20Standards.pdf>
<http://www.nextgenscience.org/next-generation-science-standards>

COURSE LEARNING OUTCOMES

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. Candidates successfully completing this program receive a credential with authorization to teach English learners. *(Approved by CCTC in SB 2042 Program Standards, August 02)*

Teacher Performance Expectation (TPE) Competencies

The course objectives, assignments, and assessments have been aligned with the CTC standards for Single Subject Credential. This course is designed to help teachers seeking a California teaching credential to develop the skills, knowledge, and attitudes necessary to assist schools and district in implementing effective programs for all students. The successful candidate will be able to merge theory and practice in order to realize a comprehensive and extensive educational program for all students. You will be required to formally address the following TPEs in this course: although other TPE's are addressed in the course, the primary 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 Teacher Performance Assessment (TPA), as part of the credential program of preparation. During the 2015-16 academic year the CSUSM credential programs will use either the CalTPA (California Teacher Performance Assessment) or the edTPA (Educative Teacher Performance Assessment).

Check with your program coordinator to determine which assessment is used for your credential program.

CalTPA

To assist with your successful completion of the CalTPA, 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. The CalTPA Candidate Handbook, TPA seminar schedule, and other TPA support materials may be found on the SOE website:

<http://www.csusm.edu/education/CalTPA/ProgramMaterialsTPA.html>

edTPA

Beginning in fall 2015, for newly entering initial candidates, the CSUSM assessment system is the edTPA. To assist with your successful completion of the edTPA, a capstone class is part of your curriculum. In this class edTPA related questions and logistical concerns are addressed. Additional support materials are available on the edTPA website:

http://www.edtpa.com/PageView.aspx?f=GEN_Candidates.html

Additionally, to support your success in your credential program and with TPA, SOE classes use common pedagogical language, lesson plans (lesson designs), and unit plans (unit designs).

Assessment of Professional Dispositions

Assessing a candidate's dispositions within a professional preparation program is recognition that teaching and working with learners of all ages requires not only specific content knowledge and pedagogical skills, but positive attitudes about multiple dimensions of the profession. The School of Education has identified six dispositions – social justice and equity, collaboration, critical thinking, professional ethics, reflective teaching and learning, and life-long learning—and developed an assessment rubric. For each dispositional element, there are three levels of performance - *unacceptable*, *initial target*, and *advanced target*. The description and rubric for the three levels of performance offer measurable behaviors and examples.

The assessment is designed to provide candidates with ongoing feedback for their growth in professional dispositions and includes a self-assessment by the candidate. The dispositions and rubric are presented, explained and assessed in one or more designated courses in each program as well as in clinical practice. Based upon assessment feedback candidates will compose a reflection that becomes part of the candidate's Teaching Performance Expectation portfolio. Candidates are expected to meet the level of *initial target* during the program.

GENERAL CONSIDERATIONS

School of Education Attendance Policy

Due to the dynamic and interactive nature of courses in the School of Education, all teacher candidates are expected to attend all classes and participate actively. At a minimum, teacher candidates 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 teacher candidate have extenuating circumstances, s/he should contact the instructor as soon as possible. (*Adopted by the College of Education Governance Community, December, 1997.*)

Note: Both attendance and punctuality are essential to completing all work satisfactorily. Point values are assigned for each class (5 pts per class or 10 pts for double classes/ field trips). In addition, only 50% of the maximum potential value for an assignment can be credited as makeup for an assignment that is due and reviewed in a class but 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.

Teacher Candidates 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 Disabled Student Services (DSS). This office is located in Craven Hall 4300, 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

The writing requirements for this class will be met as described in the assignments. Every course at the university, including this one must have a writing requirement of at least 2500 words.

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 assignments must be original work, clear and error-free. All ideas/material 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 accordingly.

Academic Honesty and Integrity: Students are responsible for honest completion and representation of their work. Your course catalog details the ethical standards and penalties for infractions. There will be zero 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.

Refer to the full Academic Honesty Policy at:

http://www.csusm.edu/policies/active/documents/Academic_Honesty_Policy.html

Plagiarism

As an educator, it is expected that each candidate (course participant) 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.

Electronic Communication Protocol

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

Things to consider:

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

In addition, if there is ever a concern with an email I send to you, let's talk in person so we can correct any confusion.

GRADING STANDARDS /OVERVIEW OF ASSIGNMENTS

The Assignments and point value for both semesters are listed in numerical order and described in more detail in the following section "Description of all assignments" below.

The final grade for EDSS 545 A/B will be the % of total points earned that semester converted to a letter grade (93-100=A; 90-92=A-; 83-89=B; 80-82=B- etc.) Assignments are due on time and will not be accepted late unless there are extenuating circumstances. Assignments with an asterisk * are Spring Semester or both

- 1) Attendance/participation (5 pt. per class) (50 pts.) *
- 2) Sci. Methods Text Readings/Questions/Prompts/Discussion/Notes (9 pts each) *
- 3) Jigsaw of California science frameworks and standards (10pts)
- 4) Evaluation sheets on best practices for education technology tools (I-Pads) and software (apps) (10 pts) *
- 5) Evaluation of Science Internet sites (10 pts) *
- 6) A/ B Inquiry---Discrepant event reflection/ presentation(s) (30 pts)
- 7) Applying Action Research by comparing SDAIE to Traditional Labs (35pts) *
- 8) Development of an outline for a Personal 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) Enrichment and extracurriculum science programs (40 pts) *
- 11) Book Report on high interest science book (10 pts.) *
- 12) Open ended/independent science study both semesters (10 pts) *
- 13) Strategies for implementing field trips at the high school level (Safari Park/Beckman Center) = (20 pts) *
- 14) Researching and presenting a mini-lecture on a current topic in science (25pts) *
- 15) Two Case Studies one per semester: Issues in student teaching and proposed action plans =(5+5+5+ Final (20 pts)=35pts.) *
- 16) Implementing Open ended vs. Closed Ended Experiments (10 pts.)

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)
- 3) Other to be determined in consultation with instructor.

Point's summary:

Fall Semester: Assignments #1 (50 pts); #2 (54 pts); #3 (10 pts); #6 (30 pts); #8 (10 pts) #9 a-b (10+5); #12 (10 pts); #13 (20 pts); #15 (35 pts); #16 (10 pts.)= 234 pts.

Spring Semester: Assignments #1 (50 pts); #2 (45 pts.) #4 (10 pts); # 5 (10 pts.); #7 (35 pts.) #10 (40 pts.); #11 (10 pts.); #12 (10 pts.); #13 (20 pts.); #14 (25 pts.); #15 (35 pts.) = 290 pts

Description of all Assignments (by number): both semesters included

***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 text** (9 points each chapter) Each chapter is assigned a value of six points that includes your response to a prompt, reflections, questions) as well as a discussion of these with your colleagues in class and on EDMODO (minimum of two plus the instructor) (3 pts).

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

Spirit of the assignment: How to teach science to all students by overviewing the entire frameworks and applying your understanding of standards by integrating them in an inquiry based curriculum. More specifically your team will overview the entire frameworks (by using the jigsaw method), discuss your findings and then demonstrate your understanding of the specific standards for your content area (Physics, Chemistry, Earth or Life Science) by developing a mini-lesson outline. It's important that you do the reading and the write-ups BEFORE you meet with your team.

Framework summary responses

3a Individual Work (3 points)

- Read the California Science Framework Chapter One introduction and Chapter Two (Nature of Science) and write a one-page summary with questions and comments from each. For the standards chapters read only the subject area standards for high school content subject area (9-12) that you are assigned i.e. Physical Science, or Life Science or Earth Science Think about the readings holistically and construct an inquiry based mini lesson for one or more content and experimental standard (see 3B below)
- Read and Write about a page for the non-standard chapter which you are assigned Ch. 4-11 as part of the jigsaw that address these questions: What do you think are **the most important** ideas addressed in the reading? Were there any ideas in the reading, which were new to you? What are your questions?

3b Science subject standards response (only your subject area) (2 points)

- Using the standard for your chosen subject, (assume a general course) pick one or more content and experimental standard. 1) Choose and write the standard(s); 2) come up with a brief description of an inquiry based activity those students in that subject area can do and; 3) how can it be assessed and 4) how can this lesson incorporate other ideas discussed from the other chapters that you read in the California Frameworks.

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 3b. Choose one that your team feels is the best representation of the application of the standards/frameworks or integrate two that may work together. Elaborate and enrich the original based on input from all members.
- As a team, write up a lesson plan for the activity stating the standard(s) (with activities, assessment,). This lesson plan should also try to integrate the ideas from the individual team chapters 1-11 as discussed in 3b above. Put it on chart paper or on the computer. 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, 1) present your inquiry based lesson plan and how the other areas addressed in the frameworks might be integrated into this lesson; 2) present an overview of the major standards expected to be addressed in your subject area; 3) which ones might you team de-emphasized or eliminated if time is a factor; 4) address any questions from classmates.

*Assignments 4 and 5 (Evaluation and Use of Technology Resources) Spring Semester Only

Assignment 4 Internet Sites (10 pts);

Assignment 5 Technology tool/software as utilized by the I-Pad/I-phone or other devices (10 pts)

Spirit of the Assignment: individually explore Internet resources (web pages, simulation games etc. and technology tool (I-Pad).

For assignment #4 explore in detail at least one Internet site that is a valuable for teachers or students for information, simulation etc. List the URL and access it on Smart classroom projector and navigate the site and explain how you would use it in your classroom.

For assignment #5 explain or demonstrate a tool or strategy for using the I-Pad/I-Phone or some other supporting technology for science teaching. **Demonstrate** it in front of class and how you would apply it to the Science classroom.

Assignment 6: Inquiry based Discrepant Event Presentation (30 pts)

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 with middle or high school age student(s) and reflect on the student's responses and their understanding/misunderstanding. Working by yourself you will present your discrepant event to the class and give a copy of the lesson plan to each class member (see model lesson from "Bouncing Balls" DE Presentation or Discrepant Event Textbook).

- 6a. Discrepant Event Lesson Plan and Presentation 25 points
- Determine a discrepant event lesson that connects to the subject matter of your CP1 experience. You can get one from Discrepant Events, by Keating, or go to another available resource.
 - Get together the materials needed for the discrepant event.
 - Practice doing the event on your own.
 - Make sure you understand the science behind the event.
 - Do your discrepant event with at least one middle or high school age student prior to doing it in class and take careful notes on the student's responses. (This ties in with Assignment 6b reflections.)
 - Present your DE to the class. (You may discuss your findings from the pre-event DE with your classmates 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 and your reflective individual 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 description of what happened, with special attention to 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: Applying Action Research to a Science Lab (SDAIE) modification (35 pts) Spring Semester (See Addendum B for Final Report Template) Spring Semester Only

Spirit of the Assignment: Use an existing science lab or activity that you will use in CP 2 and rewrite it to be more appropriate for second language learners (use SDAIE/ELL techniques as discussed in this course (Ch. 12) as well as others you have had). You will use the action research model to evaluate its effectiveness by comparing outcomes of the experimental lab (SDAIE) you created with a control (original lab or activity) using classes you teach in CP 2.

Specifics of the assignment: The assignment consists of four parts.

- Discuss readings and other resources related/connected to ELD Standards and related strategies as a basis for modification of existing laboratory activities. Discuss the Action Research Model.
- Display a copy of the original science lab or activity and revised SDAIE lab explaining the adaptations you have made (5pts);
- Design an action research proposal using the action research design (see syllabus) and present this to the class for discussion (5pts).
- After you have completed the research present the findings (Final report= 25 pts) by comparing outcomes from the two lab classes one, which used original lab (control) and another who used the modified SDAIE lab (experimental).

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. More specifically this might include 1) information/resources from your MT interview assignment 9B: safety contracts, demonstrations, laboratory protocols, lesson plans they use to teach safety, as well as any general experiences in dealing with science safety and 2) the textbook (Ch. 14), California Safety Manual, Flinn Safety Manual.

Assignment 9A 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?
- What other non-instructional strategies supported or distracted from the teaching of this lesson?

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.

*Assignment 10: Enrichment and Extracurriculum Science Programs (Spring Semester only (40 pts)

Spirit of the Assignment: Students will research, overview and discuss some of the major extracurricular activities used in Science such as Science Research Projects (Science Fair/ Pure Science), Odyssey of the Mind (Problem Solving), Science Olympiad, FIRST (Robotics) and Invention Convention (Applied Science). Elements of some of these models will be applied by simulating the actual process used by teachers in a classroom. The process includes the following: 1) Students will be assigned teams and specific problems for Odyssey of the Mind (Long Term Problem, Spontaneous Problem and Style) and the Invention Convention. 2) Using the processes recommended and timelines (and examples reviewed) teams will follow the processes and enter their formative tasks on Google Docs (instructor will provide ongoing feedback and evaluation on Google Docs for each team; 3) Teams will present their final solution to each project and be evaluated by the rubric (see syllabus) and compared to the other teams.

*Assignment 11 Book Report on high interest science book (10 pts.) Spring Semester only

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) Both semesters

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 Beckman Center/ Safari Park (Spring 20 pts)

Spirit of the assignment: by attending this field trip students will: 1) general procedures for planning an implementing a field trip in science for all students including ELL; 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 present a mini-lecture in class on that topic (25 pts). Spring Semester only

Spirit of the assignment:

Research a current issue or topic (outside the traditional science textbook) that could be used in a class you are scheduled to teach in CP2. The instructor will model a mini-lecture prior to student presentations and a rubric will be developed through a class discussion based on information on effective lectures/discussions from Ch. 11. During this 15- minute mini-lecture and (or) scientific argumentation/discussion you will practice applying some of the best practices pedagogical strategies suggested from Chapter 11. Besides basic lecturing suggestions (Figure 11.2 p.203); these should include appropriate visual and kinesthetic aides; discussion/questioning/argumentation techniques (Table 11.1 p.216 discourse patterns and p 220-1 scientific argumentation) and a range of writing tools (Table 11. /2 p 217). The class audience and instructor will discuss your presentation and evaluate/provide feedback using the rubric for a Science Mini-Lesson (see syllabus). 25 pts

*Assignment #15 Issues in Science Student Teaching (Case Study/Action Research Approach-See Addendum C): both semesters (35 pts each semester)

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 outcomes based on the action plans implemented. One final written Case Study will be required each semester. Includes a minimum of three Preliminary reports #1 (5pts), #2 (5pts.) and #3 (5pts.) and a Final report (20 pts.) =35 pts

Assignment #16 Comparing The Value of Open ended (Inductive) Lab experiences to Closed Ended (Deductive) (10 pts.)

Spirit of the Assignment: Teams will be presented a problem related to the “Paper Towel Experiment” and using the Scientific Method (or 5 E Inquiry Model) design an experiment using “tools” on hand. Teams share the design, data and findings of the experiment and value (challenges) to have students use this model. Ideas for implementing and integrating inductive/inquiry learning are shared.

Summary of Spring Semester Assignments (by number)/Requirements: (each will count as the points noted). The final grade (see grade sheet) will be the % of total points earned that semester converted to a letter grade (90-100=A etc.)

- 1) Attendance/participation (5 pt. per class) (50 pts.)
 - 2) Science Methods Text Readings/Prompts/Discussions (5 Chapters @ 9 pts each for addressing prompt plus comments to others) (54 pts)
 - 4) Presentation on Science Internet sites (10 pts)
 - 5) Presentation on technology tools (I-Pad etc.) (10 pts)
 - 7) Applying Action Research to a SDAIE Lab study (35 pts.)
 - 10) Enrichment/ Extracurricular Activities in Science Teaching (OM/Inv.Convention) (40 pts)
 - 11) Book Report on high interest science book (10 pts.)
 - 12) Open ended science related event both semesters (independent study) (10 pts)
 - 13) Strategies for implementing field trips at the high school level: Beckman Center/Safari Park Lab (20 pts).
 - 14) Presenting a mini-lecture on a current topic in science (25 pts)
 - 15) Case Study2: Issues in student teaching CP2 =(5+5+5 +20)=(35 pts)
- Total=290 pts.

Optional/Extra credit: (maximum 10 pts)

- 1) Directorship (5 pts.)
- 2) Attendance at a Science Conference: SDSEA or CSTA or NSTA or other Conference (5 pts. one day)
- 3) Other

COURSE SCHEDULE/CALENDAR AND OUTLINE:

Spring Semester EDSS 545 B:

Assignments due prior to Class #1 January 28 or Class #2 February 18th

- 1) For Class #1: After Reading Ch. 11 (Lecture) respond to this prompt and send online to EDMODO: What are the pros and cons of using lectures (expository teaching)? Which of the ideas in this chapter will you incorporate in your 15-minute mini-lecture? What questions do you have about lectures and the other strategies suggested in this chapter? Send online to EDMODO prior to first class.
- 2) For Class #1: Review syllabus for second semester prior to class with special attention to the following: 1) copy spring semester grade sheet; 2) assignments required; 3) description of each assignment. BRING ANY QUESTIONS TO CLASS
- 3) For Class #2: Complete Assignment #4 and #5: Select an I-Pad application (or some other science/technology tool) to (see assignment #5) and science web page(s) #4 to demonstrate in class.

#1 January 28 (Thursday) Theme: The lecture/expository teaching as a strategy in Science

- Review syllabus for second semester prior to class with special attention to the following: 1) copy spring semester grade sheet; 2) assignments required; 3) description of each assignment. BRING ANY QUESTIONS TO CLASS
- Overview of a graphic organizer for semester 2
- Discussion of prompt from Ch11 (Effective Use of Lectures) (set schedule of mini-lectures). Should be entered on EDMODO prior to class. Some students might select "Teaching Science using Argumentation"
- *Discussion of assignment regarding ratings of technology tools (I-Pad) #5 and Internet web resources #4 (see description in syllabus). Some students might choose "Using apps for formative assessment" (See EduTopia article)
- Keating mini-lecture #1 Model lecture that integrates some of the ideas from Ch. 11 "Factors that affect the success of Navajo Students in High School Science"
- Interview Questions Forum

Next time:

- 1) Per schedule (2-student presentation maximum) prepare a mini lecture as part of a small unit on some current topic/issue in Science as one of your classes this semester Assignment #14
- 2) Presentation/Handout of ratings of technology tools/ (I-Pad) #5 and Internet resources #4 (Demo one of the top ideas for each)
- 3) Read and address prompt for Ch. 13: "Laboratory and Fieldwork": What are some suggestions for effective use of both of these strategies especially making them more inductive/inquiry based? List a variety of alternative and traditional ways that laboratories and field experiences can be assessed? In your experience so far what observations have you noticed that make both of these strategies less effective (and what would you suggest to overcoming these challenges?). Questions? Send online to EDMODO prior to next class
- 4) Read Ch. 15 Computers and Educational Technology. Based on the content of each of this chapter: Discuss the range of technologies you have used (or seen) that you believe are effective in the science classroom (Elaborate and Be specific). What are some technologies that you have not used but would like to have? What are some issues in using technology in teaching science? Questions? Send online to EDMODO prior to next class.

#2 February 18 (Thursday) Theme: Technology resources in Science

- Presentation of mini lesson on current topic in science (15 minute max) (aligned with Ch. 11 Lecture Strategy) Assignment #14 (1-2 presentations)
- Discussion of Best Practices in Science Teaching from both technology tools/software and Internet Resources for:

#4 explore in detail at least one Internet sites that is a valuable for teachers or students for information, simulation etc. List the URL and access it on Smart classroom projector and navigate the site explaining how you would use it as a resource.

#5 explain or demonstrate one use of the I-Pad or other science technology tool, that you have used or know how to use that would be valuable for a science teacher.

- Discussion of prompt responses from Ch. 13 and Ch. 15 on technology (online).
- Keating mini-lecture #2: "Effective strategies to promote cooperative learning in a secondary science class"
- Interview Questions Forum

Review Assignments for Next class:

- 1) Reading prompt to respond for Ch. 9 (Teaching for Diversity): As a result of this reading as well as others from EDSS 555: What are some specific SDAIE strategies (teacher, student and curricular) you would (or have) use to adapt learning for second language learners in your science classroom (elaborate and be specific)? Specifically which ones would you utilize for lab exercises? (Send response online prior to next class)
- 2) Prior to class explore in teams (to be assigned) one of the following websites for a specific Science Extracurricular Activities and do a brief presentation to discuss them in class:
 - Odyssey of the Mind= <http://www.odysseyofthemind.com/> (note video)
 - Science Olympiad (San Diego and National Websites)= <http://www.sandiegoso.org/> and <http://www.soinc.org/>
 - FIRST (Robotics)= <http://www.usfirst.org/roboticsprograms/frc>
 - Invention Convention=<http://ge.geglobalresearch.com/inventionconvention>
 - **Science Fair**=<http://www.maranatha-hs.org/document.doc?id=1083> and <https://docs.google.com/presentation/d/1iU0KPQk0aP8lhpmnWsBIESlftGpNSGqHN1RoA23wxLE/edit?pref=2&pli=1#slide=id.p> (**Powerpoint workshop on implementing San Diego Science Fair**)
- 3) Issues in Science Student teaching formulate a **question or problem** that you will address in CP 2 (development of Case Study 2 Issue(s) (#15) Send to EDMODO prior to class.

#3/#4 February 27th (Saturday 9-3) Themes: SDAIE instruction in Science and Extra-curriculum Strategies in Science

- Discussion of reading response to prompt from Ch. 9 Diversity in Science Instruction (online) as lead-in to Overview of SDAIE action research project assignment (#7)(see addendum B for format and process)
- Keating mini-lecture #3: "Successful SDAIE/ELL strategies with High School Laboratory Science" (PPT)
- Student Mini-Lectures (2-3 presentations) with critique/evaluation
- Discussion/Presentation of Webpage information and overview of curricular and extracurricular science activities: FIRST, Science Olympiad, Odyssey of the Mind, Science Fair and Invention Convention as additional models of Inquiry based learning (some modeling and practice in implementing these)
- Short term problems for OM (in class: Superlinks and Verbal/Non-Verbal Communication)
- Assign teams for presentation of "Invention Convention". Use Google docs to share ideas (formative tasks) with colleagues and instructor. Assignment #10 Presentations due: Invention Convention (Class #6 March 24th)
- Interview question forum for Science teachers
- Issues in CP2 presentation of **question or problem** that will be addressed in CP 2 (development of Case Study 2 Issue(s) (#15)

Review Assignments for Next Class:

- 1) Case Study Preliminary Presentation #2: Baseline data for proposed study and potential action plans due March 10.
- 2) Continue to work on team presentation for Invention Convention for March 24.
- 3) Continue to work on Book Report for April 28.
- 4) Continue to work on Independent study project due last class April 28^h.
- 5) Read and create a series of prompts (and respond to them) that address the content of either Ch 10 (Learning in Middle and High School) or Ch 12 (Science Engineering and Societal Issues) and send to EDMODO prior to class.

#5 March 10th Thursday Theme: Using Action Research as a Science Teacher (Case Study CP 2)

- Mini-Lecture presentations (2)
- Case Study Preliminary Presentation #2 Baseline data and potential action plans Assignment (#15). Send to EDMODO prior to class
- Preliminary overview of lab sheets for the SDAIE vs. Traditional lab (show draft for both) plus your Action Research Proposal for this study (see addendum A in syllabus)
- Keating mini-lecture #4 “How to effectively implement Cooperative Learning in a Science Classroom”
- Discussion of Ch 10 (Learning in Middle and High School) and or Ch 12 (Science Engineering and Societal Issues)
- Interview Questions Forum

Review assignments for next class

- 1) Final report on SDAIE Lab Action Research Report (#7). Send to EDMODO prior to class.
- 2) Presentation of final group solutions for the Invention Convention
- 3) Preliminary discussion #3 on issues (CP2) #15: preliminary data from action plans. Send to EDMODO prior to class.
- 4) Book report written and oral presentation (overview and application to teaching). Send to EDMODO prior to class.

#6 March 24 (Thursday) Theme: Applying Enrichment and Extracurricular Programs to Science Teaching

- Preliminary report/discussion #3 on progress of Issues in Science Student teaching CP2 (#15): Preliminary data?
- Assignment #7 SDAIE vs. Traditional Lab (Action Research) Final Report/Presentation (See addendum A for format)
- Invention convention team final presentations
- Keating mini-lecture #4: “Teaching Science to a Heterogeneous Classroom (Differentiation in Science)”
- Mini-Lecture presentations (final 2)
- Interview Questions Forum

Review Assignments due for Class #9 (April 25th) Field Trip to Reuben Fleet Science Museum

Web site information and lesson plans will be sent prior to field trip for review as part of the discussion the day of the field trip.

Review assignments due for last class #10 (April 30):

- Complete Independent Study/Open date assignment (#12) and send report to EDMODO prior to class.
- Continue to gather data for Issues in Science Teaching Final report #15 (See syllabus addendum C for Case Study format) due last class or later.

#7 Independent Study Assignment #12 (To be completed independently any time during the semester and reported during class #10)

#8/#9 TBA: Field Trip to a Formal Science Resource Community site (Safari Park and Beckman Center):

Theme: Use of Community Resources in the Curriculum (Assignment #13)

- Educational Resources at museum (based on handouts/Webpages)
- In subject matter teams: Design a pre/ during/post lesson plan for an Animal Observation Study at the Safari Park t (final team written design made available to all via email)
- Complete Lab at the Beckman Center (Reflect with group)

#10 April 28 (Thursday) Theme: Using the Case Study Model of Action Research to assist in Solving Problems in Science Teaching

- Final or Preliminary Report: Issues in Science Student Teaching CP2. Assignment #15
- Independent Study presentation #12
- Book report presentations
- Interview Questions Forum
- Keating mini-lecture "Brain Research and how it informs teaching" (Brain Institute Conference and Brain Literature)
- Final evaluation of course: Review/Assessment/redesign of Graphic Organizer
- Instructor evaluations

ADDENDUM A ACTION RESEARCH

(Action Research Design Proposal/Final Report: Use with Assignment #7 SDAIE Lab Modifications) Similar to Case Study (with a more formal approach)

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 B CASE STUDY

(Case Study Preliminary and Final Reports)

Case Study (Action Research) Considerations for Assignment #15 Issues in Student Teaching

A case study is a formal but dynamic strategy of teacher led research (action research) that uses a collaborative process to 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 (Preliminary Report #1) what factors are 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 i.e. Action Plans (treatment) and Data Collecting methods (*Preliminary Report #2*) based on general knowledge from classes, readings, master teachers and prior experiences. After you have discussed the issue with your colleagues 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. In terms of data collecting I would: observe student behavior in lab classroom compared to the regular; use a focus group of students discuss their perspective of this new space; compare results of lab/test scores pre and post this treatment.*
- 3) Propose an action plan with specific actions and a timeline (includes collecting baseline data) *Preliminary report #2*
Observe behavior, collect test scores etc. prior to changing rooms. 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. Use the baseline data to compare to data after the treatment. Note limiting and delimiting factors.
- 4) Ongoing collection of data from observations and responses to your plan Preliminary Report #3. Not you may decide to drop or add specific action plans based on preliminary findings.
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. Also noted: there were less behavioral issues and more time on task. Lab scores increased 10% all compared to baseline data. Will see if it is possible to use twice a week.
- 5) Final Report should include discussion of 1-4 above in addition to the summary of the outcomes and implications from the findings of the Case Study. What were the successes and the challenges to the plan? What would you do in the future (steps) to improve on it? What have you learned from the study?

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. I will make these recommendations supported by my final report, which included less classroom management issues, and higher achievement compared to baseline data.

ADDENDUM C SPRING GRADE SHEET

Name:

Assignment Number/topic

#1 Attendance (5pts each date) 50pts total

#2 Science text reading prompts/responses on EDMODO (9 pts X 5 = 45 Pts.

Ch. 9 (Diversity)___Ch. 11 (Lectures)_____ Ch13 (Lab and Field Work)_____ Ch. 15 (Computers and Ed Tech) Ch. 10 or Ch. 12 (choice)_____

4 Presentation/Evaluation of Website (10 pts)

#5 Presentation/Evaluation of technology tool/software (10 pts)

#7 Action Research Study on Effectiveness of SDAIE vs. Traditional Lab Experiences (10 prelim (labs +action research proposal + 25 final)= (35 pts)

#10 Enrichment and Extracurricular activities in Science (40 pts.)

- Team presentations of overview of various programs (10 pts)
- Preliminary Problems for OM= 10 pts
- Preliminary (10 pts) and final presentation (10 pts) for Invention Convention (20 pts)

#11 Book Report on Science reading (oral and written reports) = 10 pts

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

#13 Attendance and participation on Science Field Trips (Safari Park and Beckman Center) (20 pts)

#14 Mini-Lecture on science topic (25 pts)

#15 Issues in Science Teaching (Case Study) Three Preliminary Reports (15 pts) and Final (20 pts.)= 35 pts total

Actual/Total Possible: 290

Extra Credit (10 pts possible)=