California State University
SAN MARCOS
SCHOOL OF EDUCATION

Engaging diverse communities through leading and learning for social justice.

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Course Number	**EDSS 545 B (2.0 Credits)**
Course Title	**Secondary Science Methods**
CRN	**41033**
Days	**Wednesdays/Thursdays/Some Saturdays**
Time	**Time Frame of course: Ten class meetings**
Course Location	**Room UH 273 (Thursday or Saturday)**
Semester / Year	**Fall 2015**
Instructor	**Joseph Keating, Ph.D.**
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Office	
Hours	**By arrangement**

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

TABLE OF CONTENTS

The pedagogy of teaching science to all students through an inquiry, community based curriculum.

COURSE DESCRIPTION

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

Course Prerequisites:

Admission to the Single Subject Program or pursuit of a single subject Science 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 semester 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 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 Assessments (TPA). **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**

Course Objectives:

These objectives will be measured (by utilizing rubrics) through the successful application of the concepts during the completion of specific assignments (see descriptions). Prior to completing the assignments, students will be presented with opportunities to discuss effective models and examples, using texts and other readings and through discussions both in-class and EDMODO (blog). 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, ethics 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** such as interactive expository teaching; inquiry-based learning; open-ended laboratory experiences; teaching from argumentation 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) as a major tenet of NGSS;
9) The teacher candidate will be able to **include all students in the curriculum** by applying the major curricular and pedagogical 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-led research designs (action research)** for the ongoing purpose of improving practice.

REQUIRED TEXTS

*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
Next Generation Science Standards (NGSS) Overview and Conceptual Shifts
http://www.nextgenscience.org/next-generation-science-standards
CA/NGSS Clarifications/Examples
http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp
NGSS Sample Science Unit= http://www.nextgenscience.org/sites/ngss/files/HS-LS_Bee_Colony_version2.pdf

TEACHER CANDIDATE 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).

GENERAL CONSIDERATIONS

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 also 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.

School of Education Attendance Policy

Due to the dynamic and interactive nature of courses in the School of Education, all candidates (course participants) are expected to attend all classes and participate actively. At a minimum, candidates (course participants) 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 candidate (course participants) have extenuating circumstances, s/he should contact the instructor as soon as possible. *(Adopted by the COE 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 field trips). In addition, 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 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.

Use of Technology

Candidates are expected to demonstrate competency in the use of various forms of technology (i.e. word processing, electronic mail, Moodle, use of the Internet, and/or multimedia presentations). Specific requirements for course assignments with regard to technology are at the discretion of the instructor. Keep a digital copy of all assignments for use in your teaching portfolio. All assignments will be submitted online via EDMODO, and some will be submitted in hard copy as well. Details will be given in class.

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.

Credit Hour Policy Statement

Since this course is considered a "lecture mode" of instruction per university policy, expectations are that students will spend a total of approximately 30 hours of class time per semester (2 credit class X 15 hours per credit= 30hrs). In addition, students are expected to spend about 4 hours per class meeting (2 hours per credit hour X 2 credits) in preparation, assignments and readings.

EDSS 545 A/B COURSE INFORMATION/ASSIGNMENT DESCRIPTIONS

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".
The final grade for EDSS 545 A/B with 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. Spring only *

1) Attendance/participation (5 pt. per class) (50 pts.)
2) Sci. Methods Text Readings/Questions/Prompts/Discussion/Notes (6pts each)
3) a,b,c Jigsaw of California science frameworks and standards (20pts)
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) 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 and Reuben Fleet Museum = 20 pts each
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 per semester)

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:

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

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

Assignment 1 Attendance and Participation (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 with your colleagues.

Assignment 2 Science readings in text (9 points each chapter) Each chapter is assigned a value of nine points that includes your response to a prompt = 3 pts. (see specific text chapter) as well as your response to others on EDMODO (3 pts). This is followed by a discussion with your colleagues in class (3 pts). You are expected to respond to at least two students and myself on EDMODO for each assigned reading.

Assignment 3 – Understanding and applying the Next Generation Science Standards (NGSS) (20 pts)

Spirit of the assignment:
This assignment overviews what (content) should be taught and what (process/strategies) research suggests is most effective in teaching science to all students. This overview will lead to you and your team to apply your understanding of these standards and strategies by integrating them in an inquiry-based lesson. These same skills will be elaborated on throughout the course and during CP 1 and 2 and will be applied numerous times in other assignments. It is also essential to your training as a science teacher to understand the general principles of this new paradigm as you seek potential employment.
More specifically your colleagues as members of different subject matter teams will assist in overviewing the entire NGSS (by using the jigsaw method). This beginning learning process consists of three components 3a, 3b and 3c (see specifics below).
In 3a, you will individually read and respond to NGSS documents as well as view NGSS video's independently from the various areas of the NGSS (see two links under required texts (Flip Classroom model).
In 3b, you will individually use the information and examples from these documents to create an outline of a lesson plan (see specifics below).

3C will be completed in class with your subject matter team and consists of discussing the important ideas from the NGSS readings and sharing your lesson plan with your subject matter team (Jigsaw 1). Each subject matter team will choose one representative lesson to elaborate and enhance and use this to demonstrate their understanding of a specific standard for their content area (Physics, Chemistry, Earth or Life Science) for the entire class (Jigsaw 2). During the subject matter team presentation to the whole class (10 minutes) the following should be accomplished: 1) Present an overview of your inquiry based mini- lesson; 2) Present a short overview of all the major standards expected to be addressed in your subject area; 3) Give a rationale for which standards might be de-emphasized or eliminated if time is a factor; 4) Address questions from other subject level teams. team in class. In the 10-minute presentation you should be able to accomplish the following: **It's essential to your beginning understanding of NGSS that you do the reading, responses and individual lesson plan BEFORE you meet with your subject matter team in class.**

NGSS Standards/Framework specific tasks

3a Individual Work (prior to class) (10 points) Use this link to assist http://www.nextgenscience.org/next-generation-science-standards

- **Read the following Framework sections and take notes and suggest questions for discussion in class** from the NGGS that are representative of a beginning understanding: 1) NGSS Front Matter (Executive Summary); 2) Structure of the NGSS (How to Read it); 3) Conceptual Shifts (How is it different) (A) 4) View these two videos: Why NGSS and NGSS Overview; **Scan especially the introductions for the following sections:** Sections D-J.
- **Read all the NGSS standards for your subject matter area** Use the CA/NGSS link= http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp since this provides some examples and clarifications that might be useful. Focus on one of the high school content subject areas (9-12) that you are assigned i.e. Physical Science, or Life Science or Earth Science and choose one standard to create a lesson outline for that standard as described in 3b below.

3b Individual **work (prior to class) Science subject standards response (only your subject area)** (5 points)

- Using the standard (s) you chose for your subject area in 3a 1) Write the standard(s) and the context of the lesson; 2) come up with a brief description of an **inquiry based activity** that students in that subject area can do to assist in understanding the standard and; 3) explain how can it be assessed and 4) how can this lesson incorporate other ideas discussed from the NGSS standards (example cross discipline ideas/engineering concepts and applying technology and including math and language arts) as well as any other ideas suggested in the NGSS. Here is a link that describes a unit plan with a number of lessons linked to the ideas of the NGSS standards related to Bee Colony losses in the environment. It is very elaborate and of course beyond the scope of what you are doing here but could serve as a model of what might be done= http://www.nextgenscience.org/sites/ngss/files/HS-LS_Bee_Colony_version2.pdf

3c.**Team preparation and presentation** (5 points)

- Get together with your team by subject areas (chemistry, physics, biology, earth science or math). 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 final lesson plan for the activity stating the standard(s) (with activities, assessment,). This lesson plan should integrate the ideas from the NGSS Standards as well as discussed in 3b above. Compose a **visual representation** of it. 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.
- Summary: In 8 minutes or less, 1) present your inquiry based lesson plan and how the other areas addressed in the NGSS 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 (10 pts)

Spirit of the Assignment: Individually explore Internet resources (web pages, simulation games etc. and technology tools and apps (such as the 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 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 (applies the NGSS standards). You will practice your discrepant event with a middle or high school age student(s) and reflect on the student's responses and their understanding/misunderstanding and make appropriate modifications. You will then present your modified 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). Teaching and reflecting on it in CP 1 will be rewarded with extra credit (Lesson Study Model)

6a. **Discrepant Event Lesson Plan and Presentation** 25 points

- Select a discrepant event lesson that connects to the subject matter of your CP1 experience. As a model for your lesson plan you can get one from Discrepant Events, by Keating, or go to another available resource. Be sure to include an appropriate NGSS (as well as some of the elements suggested by these) or CA standard (s).

- Get together the materials needed for the discrepant event.
- Practice doing the event on your own and then with some student aged individuals (see 6 B).
- 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 as if they were your students. At some point, make sure you explain the context of the lesson and what would you do before and or after it (You may discuss your findings from the pre-event DE with your classmates as part of this presentation.
- You are limited to 15 minutes of actual 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)
- Using what you learned by doing it at least twice (Lesson Study Model) apply this DE to one of your courses in CP 2 (optional but extra credit (5 pts.) for doing it and reporting on how it went)

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.)
- Hand in a written 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 experimental lab (SDAIE) 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.
- Display a copy of the original science lab or activity and revised SDAIE lab (5pts) 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= 20 pts) by comparing outcomes from the two lab classes one of which used the original lab (control) and another which 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 (Flinn and CA) Safety documents, Chapter in text etc.) and the interview with a 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: 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. This will be sent to EDMODO and shared with others during a class discussion.

Assignment 9 Observation of science lesson and teaching strategies and strategies to apply science safety within the curriculum (10 + 5 pts= 15 pts)

Spirit of the assignment: To objectively and formally observe and critically analyze a science lesson. During your observation/participation time you will find a science teacher who may or may not be your own master teacher. For #9 you will 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 some general guidelines and questions you may use for 9 below. As part of this exit interview with the CT or other science teacher ask them the specifics of how she (he) approaches science safety. This might include: lesson plans they use to teach safety, lab safety contract, general rules used, and any general experiences in dealing with science safety. Incorporate the ideas you think are valuable to your own science safety practices as part of assignment #8 Development of a personal Plan for Science Safety (see above).

Some suggestions/ guidelines for completing 9 A (10 pts):

GENERAL INFORMATION: grade level, subject area, description of the activity/standards as well as responses to some of the suggested prompts below should be sent to EDMODO and will be discussed in class.

BEFORE (Interview)

- How did the teacher come to do this lesson? (Is it linked to the NGSS or CA Standards?)
- 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 in consideration of this

DURING (Observation)

- Is there a written or unwritten plan for this lesson?
- Does it include some elements of inquiry (in the discourse, in the activity, in the assessments)/technology/engineering?
- 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 (ELL/Special Needs)?
- 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?
- Were language arts skills (oral language, reading, writing) and or mathematical processes included in the lesson?

- AFTER (your analysis, interview with teacher, and if possible, some students)
- How successful (unsuccessful) was the lesson?
- 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 did you know?
- 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.
- **What strategies do you (master teacher) incorporate throughout your science teaching to promote science safety**?

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 and Invention Convention (Applied Science). Two of these models will be applied by simulating the actual process used by teachers. 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 Independent Study: 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 create assignments that 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 a copy to EDMODO.

Assignment 13 Attendance at a field trip to the Safari (Wild Animal Park) and the Center for Reproductive Biology (Safari Park)/Reuben Fleet Science Museum (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 of the site in a variety of ways prior to the field trip; 3) Pre, during and post lesson plans that apply the science standards by using a) site prepared and modified curricular materials; b) original teacher developed and implemented curricular plans

Assignment 14 Research **a current issue or topic in science and present a mini-lecture that you can apply in your own class (es) (25 pts). Spring Semester only**

Spirit of the assignment:

A) Research a current issue or topic that could be used in a class you are scheduled to teach in CP2. The instructor will model an inquiry-based mini-lecture or teaching science from argumentation that applies NGSS standards. A rubric will be developed through a class discussion based on information on effective lectures from Ch. 11 and used to evaluate each mini-lecture. During this 15- minute mini-lecture you model/integrate some of the effective pedagogical strategies discussed in class. The class audience and instructor will evaluate/provide feedback using the rubric for a Science Mini-Lesson. (20 pts)

B) Optional extra credit (5 pts.). **Based** on this discussion, use your modified mini-lecture in a revised version as part of one of your lessons in CP 2. This can assist you in the development of a videotape lesson as part of TPA 4.

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

Spirit of the assignment: Learn to apply a teacher-directed research model during CP 1 and 2 (Case Study/Action Research) in a collaborative setting that 1) addresses teaching issues/ problems (baseline data); 2) create potential solutions (action plans) to the address the issue (related to content, curriculum, teaching strategy and (or) classroom management); 3) collect multiple sources of data to evaluate/analyze results; 4) report findings and suggestions/recommendations. Preliminary reports will track progress of study in collaboration with the class members #1 (Statement of issue(s) (5pts), #2 (Baseline data and action plans)(5pts.) and #3 (Preliminary Data) (5pts.). #4 One final written and oral Case Study report will be presented at the end of each semester. (20 pts.) =35 pts. total

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

Spirit of the Assignment: Teams will be presented with a problem called 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) of having students use this model. Ideas for implementing and integrating inductive/inquiry learning in the Science classroom are shared.

EDSS 545 A/B COURSE TIMELINE/CALENDAR

Course Schedule/Calendar and Outline:

Fall Semester EDSS 545 A:
***=Assignment/Reading due**
Note: Prior to Class #2 please read and respond to the following readings and prompts:

Class #1 (Independent Reading/Response) Complete prior to September 17th

1) Read Ch. 1 and 2 of "Science Instruction…" Limit your response to a page or two and enter in EDMODO (Under Small Groups Chapter 1 or Chapter 2)

- **In Chapter 1 "Getting into Science Teaching" address these prompts: After reading the introductory vignette and her mentor teachers responses as well as the supporting materials explain what areas of instruction Mrs. Locke did well and what areas do you recommend for improvement? Look at Figure 1.1: What areas of science education from the chart do you have a comment or question about? How do these reflect the way you were taught science in K-Higher Ed? Complete the Science Teacher Inventory. How did you do? Explain? What are your other questions from this reading?**
- **In Chapter 2 "Purpose of Science Teaching" address these prompts: After reading the vignette and responses: Why is it so important to put an emphasis on science literacy especially in general science classes? What are some of the factors that contribute to higher performing countries doing better in science than USA (based on PISA and TIMSS studies? How can you as an individual teacher offset this? What does the NGSS and Common Core in Math and Language Arts address that has the potential to improve the USA international standing? What are your other questions from this reading?**

2) Assignment 3 – Understanding and applying the Next Generation Science Standards (NGSS) (20 pts) Complete 3a and 3b before class #2 (3c will be done in class): See directions under "Descriptions of all Assignments" pp. 6-7 for 3a, 3b and 3 c.
3) Think about and be able to respond to these questions: How would you define Science? How should it be taught in high school? What do you think is important for you to learn this year?
4) Read the syllabus *Read syllabus prior to class with special attention to the following: 1) copy fall semester grade sheet; 2) assignments required; 3) description of each assignment. BRING ANY QUESTIONS TO CLASS

Class #2 September 17 (Thursday 4:30-7:30 UH 273)

- Class introductions
- *Read syllabus prior to class with special attention to the following: 1) copy fall semester grade sheet; 2) assignments required; 3) description of each assignment. BRING ANY QUESTIONS TO CLASS
- *** Discussion of Reading responses and questions from Text Ch. 1-2 (put on EDMODO)**
- *Prior to class be prepared to respond to these questions: **How would you define Science? How should it be taught in high school? What do you think is important for you to learn this year?**
- **Discussion of Graphic Organizer for EDSS 545 (in class)**
- **Introduction to inquiry based science** through the discrepant event (DE) model with in class presentation by Keating of "Bouncing Balls" (What are the basic pedagogical elements of an effective DE?)
- **Discussion of Readings from NGSS and overview of Assignment #3 A/B/C (to be completed in Class #3-#4.**
- Discussion of MT observation assignment #9A due Class #5 (What was effective? What was ineffective? Recommendations for change?)

Review Assignments for Next time: (to be discussed in class)
1) Sign up for dates for DE (2-3 presentations) Assignment # 6;
2) NGSS standards jigsaw by subject areas assignment #3a-c;

Class #3-#4 September 19 (Saturday 9-300 in UH 272)

- ***NGSS Frameworks and Standards Jigsaw Assignment* #3 a-c**
- **Overview of TIMSS study and implications for Science Ed in US**
- ***Discrepant Events (two-three) #6 a-b**
- ***The use of Inquiry Based/Open ended/Inductive vs. Closed ended/deductive science lab experiments "Paper Towel Experiment" (in class) Assignment #16**
- **Introduction to the Compassionate Discipline Model (Keating Mini-Lecture) (will incorporate ideas from the Science Learning Environment (Ch. 6 extra credit to submit a reflection on EDMODO)**

Review Assignments for Next time:

1) Address these prompts for Ch. 4 Assessing Science Teaching and send to EDMODO prior to Class #5; Similar to the vignette why do you think many students do not perform well on summative assessments? What are some personal experiences or some that you have observed related to pre-assessments, formative and summative assessments? Give some examples of types of authentic/alternative assessments you think you will use in your own teaching? Questions on the chapter?
2) Discrepant Event (2 presentations)
3) Formal Observation of MT (#9A) (What was effective? What was ineffective? Recommendations for change?) Send to EDMODO
4) Selection of a major problem or issue in Clinical Practice for Case Study 1 (this is preliminary report #1) for Assignment #15 (also see Addendum C in Syllabus for Case Study Model)

Class #5 September 23 note: (Wednesday) 430-730 (TBA))

- ***Discrepant event presentations (one-two)* #6 a-b**
- ***Discussion of Reading from Chapter 4 Assignment #2**
- **Discussion of Findings from MT Observation #9A** (What was effective? What was ineffective? Recommendations for change?) Send to EDMODO
- **Discussion of major problem or issue in Student Teaching for Case Study 1 (this is preliminary report #1) See Case Study format model in Addendum C**

Review Assignments for Next time:

1) Address these prompts for Chapter 8 Inquiry: How would you define inquiry for your students? Describe examples of each level of the Three Levels of inquiry you have seen or for which you have been a part of? Were the three critical elements of inquiry included (Phenomena, practice and outcomes)? Was it effective? How would you improve it? What are three examples of inquiry (pp. 145-154) you would like to include? What do you see as the three most critical challenges to doing inquiry? How will you overcome these? Questions?
2) Case Study 1 (preliminary report #2)
3) Discrepant Event (1-2 presentations)

Class #6 October 22 (Thursday 430-730 UH 273) Video Conference

- *** Discrepant Events (two presentations) #6 a-b**
- *** Discussion of /Reading Prompts in Text** (Chap 8 Inquiry) due in EDMODO)*
- ***Identify <u>proposed action plans and baseline data</u>** for identified issue(s) for Case Study 1 "Issues in Student Teaching" Preliminary Report #2

Review Assignments for Next time:

1) Discrepant Events (2 presentations)
2) Identify <u>action plans preliminary data</u> for identified issue(s) for Case Study 1 Issues in Student Teaching Preliminary Report #3
3) Address these prompts for Chapter 5 "Teaching Science": Using the reflection sheet on p 86 to guide you evaluate the lesson described in the vignette and describe how you might adapt it? Which teacher attributes/dispositions do you need to work on and improve as described in pp. 88-91? Use the evaluation sheet found on p. 96 to assist in evaluating one of your science lessons in terms of your professional characteristics (attributes, teaching skills, instructional strategies and learning techniques (can be self, peer or CT or any combination). Results? Questions from the chapter?

Class #7 Independent Study: **No formal meeting**
Sometime between September and Class # 10

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, conference 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 potential applications to teaching; 2) send by email to all of us; 3) do a 1-2 minute presentation to the class during class. The report and oral presentation should include a summary of what you learned and implications for your own teaching.

Class #8 November 5 (Thursday 430-730) in UH 273) via Video Conference

- ***Discrepant event presentations (1-2)**
- **Discussion of prompts from Ch. 5**
- **Discuss your implemented action plan and any preliminary data** from Case Study Model for Assignment #15 (also see Addendum C in Syllabus for Case Study Model Final Report). This is preliminary report #3

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

- Prepare a brief written report/outline on your proposed Personal Plan for Science Safety (Assignment #8 based on Chapter 14 (text)+ MT interview+ CA Science Safety Manual+ Flinn Scientific Safety Manual (online)
- Report on Independent Study project (Assignment #12) or due before Class #1
- Preliminary report #4 Action plan and preliminary data

Class #9 December 3 (Thursday 430-7:30 in UH 273) via Video Conference)

- Presentation/Discussion of Personal Plan for Science Safety assignment #8: Flinn safety manual + MT interview+ Ch. 14 Science Safety
- Report on Independent Study project (Assignment #12) Send via email to all
- ***Discrepant event presentations (1-2)**
- Preliminary report #4 (more preliminary data)
- Instructor Evaluations

Review Assignments for Next time: Go over assignments for next class

1) Final Case Study Written Reports #15 /Conference via Face time or Skype (by individual arrangement) December (TBA)

Class # 10 December (before December 18th) conference by individual arrangement

- **Issues in Clinical Practice 1: * Final Case study report outcomes/discussion of #15 (Addendum C model) Send written report prior to conference**

ADDENDUM A

GRADE SHEET FOR FALL SEMESTER (PLEASE MAKE COPY FOR GRADE FOLDER) EDSS 545 A

Name:

Assignment Number/Name

#1 Attendance (5 pts. Each class) (50 pts.)

#2 Science Methods text reading responses and discussions (9 pts. each)
Ch1____Ch2_____Ch4____Ch5_____Ch8_____Ch14____Ch 6 (extra credit) (54 pts.)

#3 NGSS Frameworks/Standards= (20 pts.)
3a= Individual readings/responses= 10 pts.
3b= Individual lesson plan = 5 pts.
3c= Subject matter group presentation= 5 pts.

#6 Inquiry Based Lesson (Discrepant Event) (30 pts.)
6a= DE presentation and handout = 25 pts.
6b= Reflections on pre-lesson = 5 pts.

#8 Personal outline of Plan for Science Safety (10 pts.)

#9 Observation and report of a Science Lesson (15 pts.)

#12 Independent Study at a formal or informal event (report) (10pts.)

#15 Issues in Clinical Practice 1 (Case study/Action Research) (35 pts.)

#16 Open-ended (Inductive) vs. Closed-ended (Deductive) Experiments (10 pts.)

Total possible points = 234 pts.
Points earned _____
Extra Credit _____
Average/Grade_____

ADDENDUM B (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/#4. 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.