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California State University
SAN MARCOS

SCHOOL OF EDUCATION

Course Number	EDMI 545 (01)
Course Title	**SCIENCE EDUCATION IN MIDDLE SCHOOLS**
CRN Number	20827
Days	ARRANGED
Time	9:00 AM -11:45 AM/12.45 – 3.30 PM
Course Location	Woodland Park Middle School
Semester / Year	Spring 2016
Instructor	Moses Ochanji, Ph.D.
Phone	760.750.8546
E-Mail	mochanji@csusm.edu
Office	UH 416
Hours	Wednesdays 3:45-4:45 p.m. or by appt. For offsite courses: Before and after class

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

COURSE DESCRIPTION

This course focuses on developing an understanding of theory, methodology, and assessment of science in self-contained or departmentalized settings in integrated and inclusive middle level classrooms. *This course is aligned with California's SB 2042 Standards* and it is designed to provide a comprehensive overview of the objectives, skills, concepts, experiments, materials, and methods necessary to teach science to elementary and middle school children. A series of team activities will provide you with first-hand experiences in these areas. This course focuses on instructional methods, techniques, materials, lesson planning, curriculum development, organization and assessment in science. The integration of curricular areas is addressed. Methods of cross-cultural language and academic development will be integrated into the course.

Course Prerequisite: Admission to a Multiple Subject/CLAD Teacher Credential Middle Level Program.

Credit Hour Policy Statement

For each hour of classroom time spent in learning in this course, each teacher candidate is expected to spend at least 2 hours of learning outside of the classroom. Examples of outside learning are text readings and reading responses, lesson planning, working on course assignments, and practice teaching with students.

REQUIRED TEXT, MATERIALS, AND ACCOUNTS

Course Text:

Friedl, A.E. & Koontz, T.Y. (2005). *Teaching Science to Children. An Inquiry Approach, 6*[th] *Ed.* NY: McGraw-Hill. **PLEASE BRING TO EACH CLASS**

National Academy of Science (2013). Next Generation Science Standards: For States, By States. National D.C.: Academy of Sciences. Available at http://www.nap.edu/catalog/18290/next-generation-science-standards-for-states-by-states

California Department of Education (2008). *Health Education Content Standards for California Public Schools.* Sacramento, CA: CDE. **http://www.cde.ca.gov/be/st/ss/documents/healthstandmar08.pdf**

Course Material Available

    Cougar Course Resources: **

A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Available at: *http://www.nextgenscience.org/framework-k%E2%80%9312-science-education*

Next Generation Science Standards (Achieve, 2013). Available at: http://www.nextgenscience.org/

Next Generation Science Standards for California Public Schools, K-12. Available at: http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp

*Health Education Content Standards for California Public Schools K-12. (*2008).Sacramento: California Dept. of Education. Available at: http://www.cde.ca.gov/be/st/ss/documents/healthstandmar08.pdf

** If the hyperlinks do not open a document, copy and paste the URL into a browser.
Other handouts (assignments guidelines and rubrics) and resources will be distributed in class and through the Moodle course site.

COURSE LEARNING OUTCOMES:

After successful completion of this course, students will be able to:

1. Demonstrate proficiency with inquiry skills of observing, measuring, inferring, classifying, predicting, verifying predictions, hypothesizing, isolating variables, interpreting data, and experimenting.
2. Identify and use exemplary materials (technology and technology resources, curriculum, science programs, textbooks, equipment, ancillary materials) appropriate for K-8 school children.
3. Demonstrate knowledge, understanding, and use of the *Framework for K-12 Science Education* and the *Next Generation Science Standards*.
4. Demonstrate an understanding of the physical, earth, and life science concepts included in the *Next Generation Science Standards* by designing science lessons to teach the concepts.
5. Demonstrate an understanding of the Health Education Standards for California Public Schools and their connection/application to science content standards.
6. Plan, teach, and reflect on a lesson focusing on a hands-on science activity using the 5-E learning cycle approach.
7. Apply the Learning Cycle model of instruction as it relates to teaching science in a contemporary manner.
8. Identify and use simulation tools and demonstrate the use of technology to enhance elementary science teaching and learning.
9. Demonstrate confidence in leading and performing investigations designed to teach science concepts, science process skills, and scientific attitudes.
10. Effectively use authentic methods of assessment to evaluate learning of science concepts and processes.
11. Practice strategies to include all students in science (linguistically and culturally diverse, students with disabilities and other students with special needs).
12. Use reflection as a tool to increase conceptual understanding of science concepts and the ability to improve teaching.

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 the Multiple 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:

TPE Primary Emphases in EDMI 545:

- TPE 1a-Subject Specific Pedagogical Skills for MS Teaching Assignments (Science)
- TPE 5-Student Engagement

TPE Secondary Emphases in EDMI 545:
- TPE 4-Making Content Accessible
- TPE 7-Teaching English Learners
- TPE 9-Instructional Planning
- TPE 14-Educational Technology in Teaching and Learning

Teacher Performance Assessment

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
2015/16 Middle Level candidates will complete the CalTPA .

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 candidates are expected to attend all classes and participate actively. At a minimum, 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 candidate have extenuating circumstances, s/he should contact the instructor as soon as possible. *(Adopted by the COE Governance Community, December 1997).*

For this class, you may miss up to one class without penalty. Each subsequent class session that you are absent from class drops your maximum final grade by 5% points. Late arrivals and early departures will affect your final grade as well. For each late arrival or early departure you will lose 2% points. <u>A make-up assignment will be available for one missed class beyond the allowable limit (5% points for one class missed).</u> This means that if you are absent twice and complete the makeup assignment and earn full credit points on this assignment, you may not be penalized on attendance. The makeup assignment applies to <u>ALL absences excused or otherwise</u>. Absences do not change assignment due dates.

If you find that you cannot attend class due to an emergency or very extenuating circumstances, please <u>email</u> any due assignments by the start of the class session it is due.

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 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.

Students with Disabilities Requiring Reasonable Accommodations

Candidates 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. Candidates 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

In keeping with the All-University Writing Requirement, all courses must have a writing component of at least 2,500 words (approximately 10 pages), which will be administered in a variety of ways in this course including lesson plans, assessment assignments, course text reading responses, reflections, concept maps; and journal writings on authentic teaching experiences.

Course Format

Traditional face-to-face format

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. Some assignments will be submitted online and some will be submitted in hard copy as well. All assignments will be submitted online, and some will be submitted in hard copy as well. Details will be given in class.

You must use your campus e-mail account for this class. The best way to contact me is by e-mail.

Electronic Communication Protocol:

Electronic correspondence is a part of your professional interactions. If you need to contact the instructor, 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 e-mail and on-line discussions are a very specific form of communication, with their own nuances and etiquette. For instance, electronic messages sent in all upper case (or lower case) letters, major typos, or slang, often communicate more than the sender originally intended. With that said, please be mindful of all e-mail and on-line discussion 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 electronic message specifically says?
- How could this message be misconstrued?
- Does this message represent my highest self?
- Am I sending this electronic message to avoid a face-to-face conversation?

In addition, if there is ever a concern with an electronic message sent to you, please talk with the author in person in order to correct any confusion.

Computer Use During Class Sessions

You are welcome to use a laptop computer in class (in fact, it is highly encouraged to bring your laptop to class for various activities and for researching) when working on class assignments, for example. However, you will need to save checking email or other personal computer use for time outside of class. Most students find it disruptive when they are focusing on class activities or listening to presentations and can hear keyboarding in the classroom. Please be considerate of your instructor and peers in this regard. It is greatly appreciated by all!

Cell Phones

Please turn off your cell phone before the start of each class. In addition, there will be no texting during class. It is unprofessional for teachers to use their cell phone during meetings with peers or during professional development activities (our class is considered professional development!). Peers will appreciate your consideration.

Person-First Language

Use "person-first" language in all written and oral assignments and discussions (e.g., "student with autism" rather than "autistic student"). Disabilities are not persons and they do not define persons, so do not replace person-nouns with disability-nouns. Further, emphasizes the person, not the disability, by putting the person-noun first.

COURSE TOPICS OUTLINE

- The Nature of Science
- Discrepant Events in Science Teaching
- The Learning Cycle Model of Teaching
- Learning Cycle Science Lesson Demonstrations
- Writing Objectives for Student Learning
- Developing Essential Questions for Teaching Science
- Writing Science Concept Definitions
- California Science Framework
- The *Next Generation Science Standards*
- SDAIE Strategies in Science: Teaching Science to English Learners
- Inclusion and Teaching Science to Students with Special Needs
- Differentiating Instruction and Assessment in Science
- Authentic Assessments in Science
- Infusing Writing Activities in Science Lessons
- Science Curriculum Kits and State Approved Texts
- Science Process Skills and Scientific Attitudes
- Current Issues in Science Education
- Infusing Technology Tools into Science Planning and Teaching
- Science Projects, Student Research, Science Fairs
- Safety in the Science Class
- Concept Mapping

COURSE REQUIREMENTS AND GRADED COURSE COMPONENTS

Assignments Tied To Course Learning Outcomes

The following assignments contribute to the final, overall course grade. Each written assignment is expected to have a clear organizational presentation and be free of grammar, punctuation and spelling errors. There will be a reduction in points for the above-mentioned errors. Late assignments are not accepted. Prepare carefully for class, and be ready to discuss readings and assignments thoughtfully. Note Grading Standards and the Description of Exemplary Students on page 18 of this syllabus.

1.   Class Participation – 5 points
2.   Science Concept Maps – 20 points
3.   California Science Framework and Health Science Content Standards Tasks - 15 points
4.   5E Hands-on Learning Cycle Science Lesson Plan – (Groups TBD) 10 points
5.   5E Hands-on Learning Cycle Science Lesson Presentation – (Groups TBD) – 10 points
6.   5E Hands-on Learning Cycle Science Lesson Reflection – 5 points
7.   Project Based Learning Field Trip Exploration Task – 10 points
8.   Technology Integration & NGSS Activity and Reflection – 10 points
9.   Integrated Science & Social Studies Unit Webquest – 10 points
10.   Integrated Science & Social Studies Unit Webquest Presentation – 5 points
11.   Make Up Assignment – Up to 5 points for missed classes

Each student is responsible for ensuring that assignments are submitted correctly and on time. Late assignments will be penalized by a 10% point reduction each day they are late. Online assignments not correctly posted do not count as submitted and will be subjected to the late assignment policy. Keep digital copies of all assignments.

NOTE: *Each student is responsible for ensuring that assignments are submitted correctly and on time. Most assignments will be submitted in hard copy at the start of class (per course schedule), and some specific assignments will also be submitted electronically to Moodle as class resources. Keep a digital copy of all assignments for your credential program electronic portfolio.*

Final Exam Statement

There is no final exam in this course.

Grading Standards

A. 90-100%: Outstanding work on assignment, excellent syntheses of information and experiences, great insight and application, and excellent writing.
B. 80-89%: Completion of assignment in good form with good syntheses and application of information and experiences; writing is good.
C. 70-79%: Completion of assignment, adequate effort, adequate synthesis of information, and application of information and experiences, writing is adequate.
D. 60-69%: Incomplete assignment, inadequate effort and synthesis of information, writing is less than adequate.

The above criteria will be applied in conjunction with specific assignment rubrics. Points earned will determine grades:

A = 93-100 A– = 90-92   B+ = 87-89   B = 83–86   B- = 80-82   C+ = 77-79   C = 73-76

C- = 70-72 D = 60-69   F = 0-59

Policy on Late/Missed Work

Due to the interactive nature of the course and assignments that require timely preparation and planning, with very few exceptions, late assignments will not be accepted. Please contact the course instructor if there are extenuating circumstances that impede the completion of a course assignment by the DUE date.

Student Collaboration Policy

Candidates will be required to work collaboratively on selected assignments and projects with classroom peers. The expectation for such collaborations is that each candidate will contribute equitably to the process and final product.

DESCRIPTIONS OF ASSIGNMENTS

1. **Class Participation and Collaboration: 5%**

Teacher education is a professional preparation program and students will be expected to adhere to standards of dependability, professionalism, and academic honesty. Grading will include a component of "professional demeanor." Students will conduct themselves in ways that are generally expected of those who are entering the education profession, including the following:
- **On-time arrival to all class sessions and attendance for the entire class period**
- **Advance preparation of readings and timely submission of assignments**
- **A positive attitude at all times**
- **Active participation in all class discussions and activities**
- **Respectful interactions with the instructor and other students in all settings**
- **Carefully considered, culturally aware approaches to solution-finding**

Class Discussions and Participation: Students will engage in active learning each class session, and will be expected to actively participate. You may lose points for lack of participation based on the following criteria:
- Do you participate in class discussions productively, sharing your knowledge and understandings?
- Do you interact productively with your peers, taking on a variety of roles (leader, follower, etc.)?
- Do you contribute appropriately to group work—do you "do your share"?
- Are you able to accept/respect others' opinions?
- Are you supportive of others' ideas?
- Do you support your peers during their presentations?
- Can you monitor and adjust your participation to allow for others' ideas as well as your own to be heard?

2. **Science Concept Maps – 20% - See class schedule for due dates**

Assigned readings from the course text provide an important foundation for your increasing understanding of science content and how to effectively teach science. Three or four chapters from the course text *Teaching Science to Children: An Inquiry Approach* will be designated for reading on specific class meeting (see class schedule for chapter assignment). To demonstrate your comprehension of the readings, and assist you with meaningful class participation, you are asked to respond to specific science content-related reading assignments by completing a reading accountability journal entry in the form of a Concept Map. The concept map will be due at the beginning of class on the dates corresponding to the date the readings are assigned. You will only receive credit points if the concept map is completed by the start of class on date indicated in the schedule.

You will choose one of these chapters and read it to develop an in-depth understanding of its contents. For the chosen chapter, you will prepare a concept map that focuses on the science concepts (not the teaching

activities) described in the chosen chapter. The complete concept maps will have at least that has 20 concepts with linking words and be will be created using correct **concept mapping procedures**. The concept maps should be generated using a concept mapping software of your choice. Hand written concept maps are not acceptable. Recommended software is Inspiration (available on all public university student computers and accessible to all students through Cougar Apps). Other free concept mapping software is available through common internet search tools. You must print and bring a copy of your concept map to class. Put your name, chapter and date when the reading was assigned at the top of each page. You will be asked to share your concept maps with your peers at the beginning of each class session. You should be prepared to share in depth the breadth of your concepts presented in the chapter you read. Individuals will be called on randomly to share their concept maps in class. You will automatically lose half the points on the day's concept map if you are unable to share the concepts with the class.

Each concept map has a possible total of 4 points based on the following criteria:
    a) Map shows clear hierarchy or relationship
    b) The Map includes at least 20 concepts
    c) Maps cover the depth of the science content in the assigned chapter
    d) Maps use 1-2 words or nouns for Concepts (not sentences)
    e) Maps consistently use verbs or prepositions for linking words between concepts.

3. Next Generation Science Standards (NGSS) and Health Education Standards Activity - 15%

 Purpose of the assignment: To provide an in-depth introduction to the NGSS as a framework and foundation for you to begin to create science curriculum in other course assignments.

Task I A: Grade level Next Generation Science Standards Response: (Individual) – 7 pts.
Using the NGSS for your assigned grade level, pick ONE Performance Expectation (PE) from EACH standard. For each PE, come up with a brief description of an activity that children in that grade can do. You should end up with a standard (e.g MS-LS4-5), a PE, and a 3-4-sentence description of an activity. See examples on cougar Courses for what your sections should look like.

Depending on the number of standards for the grade level, you might have fewer or more sections depending on the number of standards. For grades 6-8 use the Earth and Space Science (ESS) standards for 6th grade, Life Science (LS) standards for 7th grade and Physical Science (PS) standards for 8th grade. For 5th grade choose one standard from the Physical Science (PS) standards, one form the Life Science (LS) Standards and one from the earth and space science standards (ESS).
NOTE: *These must be HANDS-ON science activities, not Internet research or writing activities!!!*

Task I B: Grade level Health Education Content Standards Response (Individual) – 3 pts.
The Health Education Content Standards for California Public Schools are categorized into 8 Health Content Standards: Essential Health Concepts; Analyzing Health Influences; Assessing Valid Health Info; Interpersonal Communication; Decision Making; Goal Setting; Practicing Health Enhancing Behaviors; and Health Promotion. These 8 content standards are included in 6 Health Content Areas: Nutrition and Physical Activity; Growth, Development & Sexual Health; Injury Prevention and Safety; Alcohol, Tobacco, and Other Drugs; Mental, Emotional, and Social Health; and Personal and Community Health.

For the same grade level assigned to you for Task I A, you will select one Health Content Standard under one of the Health Content Areas and write an activity that students in that grade level can do.
You should end up with one section for Health Education, which includes one Health Content area, one Health Content Standard, and a 3-4-sentence description of an activity that reflects both.

Bring a copy to class and also submit on cougar courses. Upload your Task I A AND Task I B (as ONE document) to Moodle session 2.

The complete write up for Tasks I A and I B should be no more than two pages. See example on below.

Task II: Team lesson sketch, preparation, and presentation – (in class with your team) – 5 pts.

Get together with your team; take takes sharing the activities you chose for each standard. . Look at the activities that were collectively written up for Task I A. Choose <u>one</u> activity. Then…

- As a team, create a PowerPoint lesson <u>sketch/description</u> for the activity (with a lesson title, NGSS standard and Performance Expectation, learning objectives, an assessment plan, and a detailed description what the students will do during the lesson). Make sure you <u>write out</u> the standard and PE on which your lesson plan is based. Add the **group lesson sketch** to the group PPT below.
- As a team, come up with a brief overview of the NGSS Standards for your grade. Don't try to give us every single line of the standards. Summarize in such a way (use bullet points) that we see generally what students are supposed to learn in your grade level--the Big ideas. <u>On a PPT, list the bulleted competencies</u> indicated in the NGSS for your grade. Upload your group PPT to Moodle session 2.
- <u>Each team member</u> should also add to the group PPT his/her Health Content Standard/Health Content Area idea (i.e., Task I B)
- In about 12 minutes, present your lesson plan sketch and science standards overview to the class. Be prepared to explain why your lesson activity represents really good science for kids.
- You presentation should include the following elements – overview of the NGSS for your grade level, a lesson description for one of the performance expectations for the standards, why the lesson activity represents good science teaching, and each member's health standard and the corresponding activity.

Your grade for this assignment will be based on the content and quality of your presentation, and on the level of collaboration with your team.

Upload the group PowerPoint to Moodle session 2. **Note: Only one submission per group is required.**

Sample Response to Assignment Tasks I A and I B.

Grade Four: Next Generation Science Standards

Standard 4-PS3: Physical Science - Energy
Performance Expectation 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
<u>Activity</u>:
Using one flashlight bulb, one insulated copper wire, and one D-battery, students will determine how to create a complete electrical circuit in order to light the bulb. Students will then use 3 insulated copper wires, one flashlight battery, a battery holder, one D-cell battery, and a brass brad inserted into a 3x5 note card to create a switch that turns the light bulb on and off.

Standard 4-PS4: Physical Science – Waves and Their Applications in Technologies for Information Transfer
Performance Expectation 4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eyes allows objects to be seen.
<u>Activity</u>
Using a prism and a flashlight, each student will separate the component colors of white light light through refraction by shining the flashlight through the prism onto a white surface (e.g., a white wall, a whiteboard) in the classroom. Using color paddles and a flashlight, student triads will explore how to produce white light.

Standard 4-LS1: From Molecules to Organisms: Structures and Processes
Performance Expectation 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
<u>Activity</u>
Using a fresh, white carnation flower placed overnight in a vase containing food coloring and water, students will use a scalpel to dissect the stem to reveal that the colored water was transported through the xylem to the flower through capillary action occurring from the roots to stem to flower.

Standard 4-ESS1: Earth's Place in the Universe
Performance Expectation 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layer to support an explanation for changes in a landscape over time.

Activity: How Do Geologists Study the Earth's Interior? The teacher will prepare 3 different colors of cake batter and layer the 3 colored batters (vary layers in each cupcake) in foil baking muffin cups. Drop in small pieces of seashells and dried plant leaves into <u>one</u> specific layer (vary each cupcake). Top each cupcake with frosting (after baking) to model soil. Each student will use a transparent plastic straw, a toothpick, and a piece of paper folded into 4 sections. One section is a prediction of what the inside of the cupcake might be. The remaining 3 sections are drawings of core samples using the straw cut to appropriate lengths.

Standard 4-ESS2: Earth's Systems
Performance Expectation 4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.
<u>Activity</u>: Using a foam mountain kit, students will construct a mountain and identify the base, peak, and elevation. Using each piece, students will first construct a topographic map and identify contour lines, the contour interval, and slope   steepness. Students will then construct a mountain profile using the data generated from the topographic map.

Standard 4-ESS3: Earth and Human Activity
Performance Expectation 4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
<u>Activity</u>: Using 30 toothpicks and 30 mini-marshmallows, each student will construct an earthquake resistant structure using cubes and triangles that will be tested in a rectangular pie pan with solidified Jello®. Students may cut toothpicks in half to build their structure. The teacher will shake each pie pan using horizontal motions (gentle pressure, mid-pressure, violent pressure) to simulate horizontal movement of an earthquake.

Health Content Area: Nutrition and Physical Activity
Health Content Standard 1.8.N - Identify ways to increase and monitor physical activity*.
<u>Activity</u>
In pairs, students will take turns in a jump rope activity. Starting with 5 jumps and increasing the jumps by 5, they will observe and record the maximum number of jumps that their partner can comfortably complete.

4. **5E Hands-on Learning Cycle Science Lesson Plan – 10 points - See class schedule for due dates**

The spirit of the assignment is to develop and teach a particular kind of a science inquiry lesson that teaches both science process skills and science content using the learning cycle instructional model.

You will work in groups of three to create and lead a science lesson based on the Learning Cycle Model of Instruction. You will prepare and teach this lesson to your classmates. Use activities from the textbook, Internet sites or other science resources. The team should teach the lesson as you would to elementary or middle school students.

The lessons should include hands-on activities that emphasize specific science process skills and specific science concepts. The Exploration and Application phases of the Learning Cycle require different hands-on science activities and manipulatives. Hands-on activities are NOT reading or completing worksheets (though they may require students to read something or complete lab observation sheets).

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

5E –Learning Cycle Lesson Procedures/ Instructional Strategies

Explain the procedures thoroughly for each phase of the Learning Cycle. <u>Include what the teacher will do and what the students will do.</u>

5E- Learning Cycle:
Learning Cycle Part 1: Engage: the "catch"
- Tap students' Prior Knowledge
- Focus learners thinking by piquing their interest
- Spark interest in the topic

Learning Cycle Part 2: Explore: the "do"

- Provide hands- on activities
- Provide common, concrete, tactile experiences with skills and concepts
- Student driven
- Inquiry based

Learning Cycle Part 3: Explain: "the lesson"

- Connect the pieces together
- Use language of instruction
- Higher order thinking questions
- Use students previous experiences as the basis for explaining concepts
- Clarify and correct misconceptions

Learning Cycle Part 4: Elaborate/Concept Application: the "enrich"
- Apply real life application using another similar activity
- Deepen understanding of concept
- Apply concept in new context
- Expect students to use content (topic) terms appropriately
- Apply or extend concepts and skills in new situation

Learning Cycle Part 5: Evaluate: the "did they get it?"
- How will your students demonstrate that they have met the objective(s)?
- What evidence demonstrates that they have achieved the objective?
- Student demonstrates knowledge of concept and/or skills

Differentiation and/or accommodation of instructional strategies and activities for EACH of these student populations (one student per population) described in your lesson plan:

Instructional Adaptations and/or Accommodations (3) for ELL students:
-
-
-

Instructional Adaptations and/or Accommodations (3) for students with special needs (SPED):
-
-
-

Instructional Adaptations and/or Accommodations (3) for GATE students
-
-
-

Also include at the end of the Lesson Plan document:

Science Content Background: 1-2 pgs minimum summary of the science content background that teachers need to know to effectively teach the lesson (goes beyond lesson content knowledge a teacher needs to know).
Web Sites: At least 3 interactive relevant (K-8) science web sites with descriptions

References: Title, author, publisher, year of all resources consulted for lesson plan concepts/ideas/activities.

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5. **5E Hands-on Learning Cycle Science Lesson Presentation – 10 points (See assignment grading rubric on cougar courses) See class schedule for due dates**

Each team will be allocated a maximum of 30 minutes of class time to teach their lesson. Prepare and use a PowerPoint Presentation or a similar presentation platform to present your lesson. The PowerPoint should include all elements of the lesson plan so that peers can see explicitly the flow of the lesson from standards, objectives, and assessment plan, and what you did for each segment of the 5E learning cycle. The presentation should also include a detailed explanation of the science content, as well as a list and definitions of science concepts important to the lesson. Include a list of websites (with short descriptions) that address the science topic and concepts through simulations, graphics and movies. You should have links to these web sites and show examples during the lesson.

Begin Exploration with students making predictions or answering essential questions or completing a challenge. You should take the activities "off the paper" and require students to use the science process skills with science manipulatives. **You need to know and demonstrate the stages of the Learning Cycle, or you will not be given credit for your lesson.** Be sure you understand the concepts you are emphasizing, and that you can explain them. The lessons should be developmentally appropriate for K-8 grade students, and should follow the NSTA Safety Guidelines.

Bring one copy of your lesson plan to class for the instructor on the day of your presentation and post a copy of the lesson plan on the online forum of the Cougar Courses page for access by your classmates.

6. **5E Hands-on Learning Cycle Science Lesson Reflection – 5 points: Due one week from the date of your presentation**

After teaching the lesson in class, you should individually complete a lesson reflection. The reflection should describe the how the activities and assessment plan address the learning goals of the lesson and the strengths, weaknesses, and recommendations for improvement. This should be done by responding to the following prompts:
- Describe the learning goals and the activities that you chose to help students make progress towards achieving these goals.
- Explain why you chose these activities for addressing the stated learning goals/needs.
- How effective were the activities in helping students make progress towards achieving the learning goals?
- How effective was your assessment plan in providing information about student progress on the learning goals? Explain the strengths and weaknesses of your assessment in relationship to the learning goals/objectives and the evidence it provided on student learning. If the assessment did not provide sufficient information, what alternative assessments would you put in place based on the potential gaps in student learning assessment?

*Approximately 2 double-spaced pages in length

7. **Project Based Learning Exploration Field Trip Activity – 10 points**

The purpose of this assignment is task is to:
  a. Distinguish the key features of project based learning from the regular science learning lessons by exploring student's learning through reviewing students' project activities.
  b. Explore and evaluate the essential features of inquiry learning by analyzing students' learning experiences, activities and projects.

You will participate in a field trip to a local project based learning school. During your visit, identify one specific project that students are working on. Either by talking to the students, teachers, or by reviewing the students learning tasks describe the specific aspects of the project activities that relate to each of the 5 essential features of inquiry discussed in class by answering the following questions/Prompts (Be sure to take notes and write responses to these questions during the visit. Type and submit your responses to the cougar courses by the stated due date.

Name of the Project/Activity: _____

1. **Students Purse a clearly defined Scientific Question(s)** – What is the scientific question(s) that students are pursuing?

2. **Students seek/generate evidence to answer the question** – What activities are students undertaking to establish evidence/data necessary to answer the science question?

3. **Students generate explanations for the questions using specific evidence they have generated** – What possible explanations will the students generate? What evidence to you see that the data/information generated will help answer the question(s)?

4. **Students evaluate their explanations relative to previous/alternative scientific work** – What alternative resources do students have access to for comparing and analyzing and evaluating their explanations?

5. **Students share/present and justify their explanations –** Are students required to present and justify their findings? What presentation formats are students required to use (if none, what format(s) might they use) to present and justify their findings?

8. Technology Integration & NGSS Activity and Reflection – *10 points*

Guest teachers and professors will be sharing a number of technology lessons and activities from their own classrooms. As they present and you try out each of the tools take reflective notes on the following prompts:

At the end of the day, you will submit on Cougar Courses a typed response to the prompts for two of the activities.

Prompt: There are 8 Science and Engineering Practices in the Next Generation Standards listed as:
1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

For your chosen technology lesson presentation explain how the activity in that lesson addresses at least 4 of the Science and Engineering Practices.

9. Integrated Science & Social Studies Unit, Webquest and Presentation–*15 Points*

This assignment is tied to the Unit Plan Project from other classes. For this assignment, you will plan a unit of instruction for an appropriate grade for an interdisciplinary team that includes science and other subject areas as desired. This unit will be appropriate for approximately two – three weeks of instruction for a heterogeneous elementary classroom as described in EDMI 544. For the science lesson of the unit, you will create a webquest that demonstrates your understanding of organizing web-based resources to specific science lessons. Your task is to think about how you can invite 5-8 grade students to participate in some aspects of your resource project through the use of a webquest.

Procedures to follow for the webquest:
a.   Read Chapter 3 in the Friedl Text.

b.   You will integrate technology in your unit plan by creating a webquest that provides opportunities for 5-8 students to use technology to explore or access the content and/or skills associated with your unit plan theme. Use zunal (www.zunal.com) or a similar webquest creation template. Your webquest must include but not limited to the following:

Introduction – Should identify a need that students can relate to and the learning objectives that will be achieved by meeting the need it achieve?

Task and product - What will the students do? The activity or task should be such that it solves the need identified in the introduction. It could be a challenge, creation of a product. Describe the problem or challenge to solve or product to create that that you will task to students with the students as your audience. What will be the final product they students will submit?

Process: How will the students go about completing the task? Describe the step-by-step process.

Resources: What resources (should include web resources) are available for students to complete the task? Note the Zunal allows you to add resources to every section of the webquest.

Evaluation: How will the products be assessed and evaluated? Include the rubric that will be used evaluate the final product.

Your final webquest will be submitted as a link through the Cougar Course site and you will share your webquest as part of your unit plan presentation. Credit for this assignment includes the webquest itself, the integrated unit and the presentation.

10. **Make-up Assignment: 5 make up points for each missed class or late arrivals/early departures**

By completing this assignment you have the opportunity to offset penalty points for missing up to two entire classes or a combination of up to three late arrivals and/or early departures. Attend a science related informal site or formal event or presentation equivalent in time and effort to one class session (3 hrs). This could be a field trip, museum, lecture or some other equivalent experience that will assist you either directly or indirectly in becoming a science teacher and expands your science knowledge. Your choice! But you may not use an activity attended prior to the first day of this class! However, you may revisit a site you have previously visited.

To complete this assignment: 1) Visit a science related informal site or formal event or presentation; 2. Participate and learn some new scientific knowledge and new ways in which the activity can be used to teach science. Document through pictures and videos or artifact collection where possible 3) Prepare a presentation of your visit documenting what you did for the 3 hours you were at the site that includes supporting evidence of (a) what science ideas and concepts you learned from the visit or presentation and (b) how the visit or presentation can be applied to teaching in K-12 environments. Include the associated standards that the activity addresses; 4) Post your presentation to the Cougar Course site related forum; 5) do a 5 minute PowerPoint presentation to the class during one of the classes. Discuss with the instructor about the class time in which you may do the presentation. The presentation must be done during one of the scheduled class sessions.

RESOURCES THAT CAN HELP IN YOUR LEARNING OF SCIENCE CONTENT AND METHODS

Journals:

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

Other Recommended Resources

Great Explorations in Math & Science (G.E.M.S.) Lawrence Hall of Science.
http://www.lhs.berkeley.edu/GEMS/

Activities Integrating Math and Science. Aims Education Foundation.
http://www.aimsedu.org/

NOTE: You must maintain a B average (3.0 GPA) in your teacher education courses to receive a teaching credential from the State of California. Courses are not accepted if final course grades are below a C+.

Exemplary "A" Students
1. Demonstrate serious commitment to their learning, making full use of the learning opportunities available and searching out the implications of their learning for future use.
2. Complete all assignments thoroughly, thoughtfully and timely.
3. Make insightful connections between assignments and their developing overall understanding of science concepts; continually questioning and examining assumptions in a genuine spirit of inquiry.
4. Attends every class, always timely, and shows high level achievement of course goals.
5. Display a "can do" attitude, give 100%, and works to help others learn too.
6. Contributes a great deal to class environment, showing respect and concern for all members.

"B" Students
1. Completes all assignments, all on time, and demonstrates the ability to summarize, analyze, and/or reflect at fairly high levels, showing consistent improvement over time.
2. Completes all of the reading assignments and develops thoughtful and fairly thorough responses.
3. Produces work that is close to professional level in terms of both content and writing, working to develop a strong command of writing, speaking, planning and presenting.
4. Develops presentations demonstrating significant learning.
5. Presents confidently and intelligently, demonstrating effective teaching skills.
6. Attends every class meeting and is regularly engaged during class.
7. Contributes to the positive environment of the class by respecting all members.

It is expected that students will proofread and edit all their assignments prior to submission. Students will ensure that the text is error-free (grammar, spelling), and ideas are logically and concisely presented. The assignment's grade will be negatively affected as a result of this oversight. Each assignment will be graded approximately 80% on content and context (detail, logic, synthesis of information, depth of analysis, etc.), and 20% on mechanics. All reference/resource citations should use appropriate citation form. Please consult with the American Psychological Association (APA) format in the APA Manual, 6th edition for citation guidance.

TENTATIVE CLASS SCHEDULE (UPDATED 1/24/16)

DATE	COURSE TOPICS & ASSIGNMENTS	Readings and Assignments Due
1/25/2016 A.M. Class Session 1	Elements of the Course and Introduction to Science Education • Course Overview: Syllabus and Text • Science Content Standards/Framework Overview • The Nature of Science	Bring Syllabus to class Read the handout called – *The Nature of Science in the Next generation Science Standards – Available on Cougar Courses*
1/28/2016 A.M. Class Session 2	What are the overarching themes that we want our students to learn in science? • NGSS and CA Science Education Framework • Focus on NGSS standards • Focus on sequencing instruction for NGSS • Writing Concept Maps	- Read the handout called *How to Read the Next Generation Science Standards* available on Cougar Courses - Bring Next Generation Science Standards book to all classes. **Due: NGSS Tasks IA & IB (Individual). Post to Moodle AND bring a copy to class** **DUE: NGSS Task II presentations due (team):** **Post group Lesson Sketch and group PPT to Moodle – (one group member posts for team**
2/02/2016 A.M. Class Session 3	Sequencing Instruction Via The Learning Cycle How shall we sequence the learning activities so that students can learn the intended themes? • Using the Learning Cycle to teach science as inquiry • Teaching Science to English Language Learners • Teaching Science to Gate and Students with Special Needs • Sign-Up for 5E-Lesson Presentations.	- Read the handout called *The Learning Cycle* Handout available on Cougar Courses and bring a copy to class.
2/05/2016 A.M. Class Session 4	ASSESSMENT IN SCIENCE LEARNING CYCLE LESSONS What shall we use as the best indicators that students have learned and understand the intended outcomes? - Concept Map Sharing #1 - Focus on Lesson Planning - Focus on Assessments (performance assessments, developing criteria for assessing learning and using rubrics) - Instructor Led Learning Cycle Lesson	*- Read Chapter 4 or 5 or 6 of Teaching Science to Children.* **- DUE: Concept Map #1 on one of Ch. 4, 5, 6.**
2/09/2016 A.M. Class Session 5	Safety Guidelines for Science Classrooms What safety considerations should be put in place during learning in science classrooms? - Share Concept Maps #2 - Focus on safety in science classes	*Read Chapter 7 or 8 or 9 of Teaching Science to Children.* **DUE: Concept Map #2 on one of Ch. 7, 8, 9.**
2/10/2016 A.M.	WRITING LEARNING CYCLE SCIENCE	-**DUE: 5E-hands-on Lesson Plan**

Class Session 6	LESSON PLANS Team time for 5E Lesson Plan/Presentation (time permitting)	**Due**
2/16/2016 A.M. Class Session 7	**Hands on Learning Cycle Lesson Presentations** What Activities of teaching shall we use to make the content accessible to ALL students? - Share Concept Maps #3 - **Team 1** The 5E Science Lesson Presentation - **Team 2** The 5E Science Lesson Presentation	*- Read Chapter 10 or 11 or 12* - **DUE: Concept Map #3 on one of Ch. 10, 11, 12 due** -Hands-on lesson Presentations x 2
2/19/2016 A.M. Class Session 8	**Hands on Learning Cycle Lesson Presentations** What Activities of Teaching shall we use to make the content accessible to ALL students? - Share Concept Maps #4 - **Team 3** The 5E Science Lesson Presentation - **Team 4** The 5E Science Lesson Presentation	*Read Chapter 13 or 14 or 15* **- CONCEPT MAP #4 on one of Ch. 13, 14, 15 due** -Hands-on lesson Presentations x 2
2/22/2016 A.M. Class Session 9	**Hands on Learning Cycle Lesson Presentations** What Activities of Teaching shall we use to make the content accessible to ALL students? - Share Concept Maps #5 - **Team 5**The 5E Science Lesson Presentation - **Team 6** The 5E Lesson Presentation	- Read Chapter 16 or 17 or 18 - **DUE:** C**oncept Map #5 on one of Ch. 16, 17, 18** - Hands-on lesson Presentations x2 **-DUE 2/23:** Hands-on Lesson Reflection from 1st presenters **- DUE 2/26:** Hands-on Lesson Reflection from 2nd presenters **- DUE 2/29:** Hands-on Lesson Reflection from 3rd presenters
3/01/2016 A.M. Class Session 10	- Share Concept Maps #6 -Writing Science Web Quests & Technology for science Teaching - Informal Science Site Visit Presentations	- Read Chapter 19 or 20 or 21 **- DUE: Concept Map #6 on one of Ch. 19, 20, 21** Read Chapter 3 of Teaching Science to Children
3/02/2016 A.M. Class Session 11	Project Based Learning Current Issues in Science Education & Scientific Community Adapting Science curriculum for children with Special Needs - Informal Science Site Visit Presentations	
3/08/2016 A.M. Class Session 12	**HTH Field Trip**	**Due: PBL Exploration Assignment**
3/11/2016 A.M. Class Session 13	Guest Speakers - Technology Integration & NGSS Activity and Reflection	
3/11/2016 P.M. Class Session 14	Guest Speakers - Technology Integration & NGSS Activity and Reflection	**Due: Technology Integration & NGSS Activity and Reflection**
3/15/2016 P.M. Class Session 15	Unit Plan/Webquest Presentations Course Review and Reflection	**DUE:** Unit-based WebQuests **DUE:** Unit-based WebQuests Presentations

NOTE: While this syllabus is carefully planned, it may be modified or adjusted at any time in response to the learning needs of the class.

Possible Work Stoppage: The California Faculty Association is in the midst of a difficult contract dispute with the CSU systemwide administration. In response to the CSU's stance, it is possible that the faculty union will call a strike or other work stoppage this term. I promise to inform the class as soon as possible of any disruption to our class-meeting schedule. For further information about the issues involved in the strike, please see the resources at www.calfac.org, including http://www.calfac.org/sites/main/files/file-attachments/faculty_index_final_2.pdf and http://www.calfac.org/sites/main/files/file-attachments/23_reasons_final_2.pdf .