

Course & Section Nos.	EDMI 545, Section 1
Course Title	Science Education in Middle Schools
Class Roster No.	
Course Day(s)	Varied
Time	9:00-11:45/12:45-3:30
Course Location	Woodland Park Middle School, SMUSD
Semester / Year	Spring 2018
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SCHOOL OF EDUCATION MISSION & VISION STATEMENT

(Adopted by SOE Governance Community, January 2013)

Vision

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

Mission

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

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

BASIC TENETS OF OUR CONCEPTUAL FRAMEWORK

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

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COURSE DESCRIPTION / PURPOSE

The main purpose of this course is to help you become **a better teacher of science content** while increasing your enthusiasm, knowledge, interest and confidence in **effective general teaching methods**. You and your peers will **model, practice in provide feedback** on ways in which science content and science processes can be naturally integrated into all the other disciplines. There will be a special emphasis on an **inquiry based, student centered, and problem solving approach** to learning that applies the **NGSS standards**. Techniques for **infusing multicultural aspects of science** and adapting lessons to meet individual needs (differentiated instruction) will also be addressed. As a result of this experience, as a middle school/ multiple subject teacher you will feel comfortable teaching science and (or) teaming with teachers who are specialists in this field, and (or) utilizing the option of integrating the ideas of science methods into **an interdisciplinary approach** (including technology, mathematics, social science and language arts).

This course is aligned with California's SB 2042 Standards and is designed to provide a comprehensive overview of the objectives, skills, concepts, experiments, materials, and methods necessary to teach science to middle school children. **A series of individual and collaborative 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 authentic assessment in science. Methods of **cross-cultural language and academic development (ELL)** will be integrated into the course.

Course Prerequisites

Admission to the Middle School/ Multiple Subject Credential Program

Course Objectives

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

1. Knowledge of using strategies that apply the Next Generation Science Standards (NGSS) into the curriculum;
2. Strategies that **integrate the three levels of inquiry based learning** into all areas of the curriculum;
3. Awareness of the multitude of **community resources** available to teachers and the ways in which these resources can be used to strengthen the science program;
4. The ability to write science lesson plans and implement them into an **interdisciplinary, integrated unit** that is appropriate to the grade-level course content;
5. The ability to design curricula, which utilize a **variety of instructional strategies including authentic assessments and technology** that develop children's higher-level thinking skills;
6. An understanding and appreciation for the dynamic nature, excitement and the **processes of science**
7. Applying the 5E/ **Learning Cycle and Scientific Method** to the learning of Science
8. Strong general understanding of **science (physical, life and earth) and health content knowledge**
9. Application of effective **technology** to enhance science teaching and learning.
10. **Strategies inclusive to all students** (linguistically and culturally diverse, students with disabilities and other special needs)
11. Understanding **science safety procedures** related to the classroom, laboratory and field experiences.

REQUIRED TEXTS, MATERIALS AND/OR ACCOUNTS

Required Texts

- Friedl, A.E. & Koontz, T.Y. (2005). Teaching Science to Children: An Inquiry Approach, 6th Ed. NY: McGraw-Hill. ISBN: 0-07-256395-8
- Use of Discrepant Events for K-12 Science Teachers (Aztec Press /University Bookstore), (Keating Customized text) May be shared if needed.
- Flinn Scientific <http://www.flinnsci.com/teacher-resources/safety/general-laboratory-safety.aspx>
- California Science Safety Manual for K-12 Schools (2012)
- Next Generation Science Standards (NGSS): Overview /Executive Summary and Conceptual Shifts
<http://www.nextgenscience.org>
- CA/NGSS Middle Level Science Standards
<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 from:
<http://www.cde.ca.gov/be/st/ss/documents/healthstandmar08.pdf>
- Online Resource for course materials: EDMODO (details in class)

Optional Texts

Moon Journals: Writing Art and Inquiry Through Focused Nature Study (Heinemann, 1997). Available in class

Chemical Magic from the Grocery Store Sae, A. Available in class

COURSE LEARNING OUTCOMES

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 districts 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.

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 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 EDM 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).

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>

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).

Expected Dispositions for the Education Profession

Education is a profession that has, at its core, certain dispositional attributes that must be acquired and developed. 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 that must be evident in teacher candidates: social justice and equity, collaboration, critical thinking, professional ethics, reflective teaching and learning, and life-long learning. These dispositions have observable actions that will be assessed throughout the preparation program. 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.

SCHEDULE/COURSE OUTLINE

Date	Topic	Assignment (if any)	Due Date
Session 1 1/23 PM	Overview/Introductions Nature Of Science	NGSS Standards Overview	
Session 2 1/24 PM	Inquiry NGSS		
Session 3 1/26 PM	Inquiry NGSS-Presentations	Team presentations of NGSS subject area lessons and overview	1/26
Session 4 1/30 AM	Field Trip to the Safari Park and Conservation Center	Presentations and debriefing in class of both lab and field experiences (pre-during and post lesson plan)	
Session 5 1/30 PM	See above	See above	
Session 6 2/7 AM	Inquiry Based Learning activities	Presentations (DE per schedule)/Content=Physical Science	
Session 7 2/7 PM	See above	See above (Inductive Labs/OM Program (in class)	
Session 8 2/13 PM	Inquiry in Cooperative Groups	Presentations (DE/Content=Earth Science) Verbal-Non Verbal Communication Game (in class)	
Session 9 2/16 PM	Independent Study in 5102	Time to work on team projects: Moon Journals, Social Studies/Science ITU, Invention Convention	
Session 10 2/23 PM	Independent Study	SEE ABOVE	
Session 11 2/27 PM	Inquiry Based Learning activities	Presentations (DE/Content=Life Science)	
Session 12 3/2 PM	Moon Journals Group 1	Presentations	3/2
Session 13 3/6 AM	Moon Journals Group 2	Presentations	3/6
Session 14 3/6 PM	ITU Social Studies/Science/Literacy	Presentations	3/6
Session 15 3/13 PM	Invention Convention Team Presentations	Presentations	3/13

COURSE REQUIREMENTS AND GRADED COURSE COMPONENTS

School of Education/Course 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).*

Personal Comments about Attendance: Prompt and consistent attendance is vital to success in this class. Attendance will be taken and class will start on time. Both attendance and punctuality are essential to completing all work satisfactorily. Only 50% of the potential value for an assignment can be credited as makeup for an assignment that is due and reviewed in a class that was not attended by the student. Two absences (in this case one full day of class =two class equivalents) 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.

Grading Policy:

Final grades for EDMS 545 will be computed as a % of the total points earned:

A = 94-

A- = 90-93 %

B = 84-89 %

B- = 80-83

C+ = 77-79

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

GENERAL CONSIDERATIONS

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.

Students with Disabilities Requiring Reasonable Accommodations

Students with disabilities who require reasonable accommodations must seek approval for services by providing appropriate and recent documentation to the Office of Disability Support Services (DSS). This office is in Craven Hall 4300, contact 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. Alternatively, in order to ensure confidentiality, in a more private setting.

Credit Hour Policy Statement

Per the University Credit Hour Policy: Students are expected to spend a minimum of two hours outside of the classroom each week for each unit of credit engaged in learning. For this course with three weekly hours of instruction, you should plan on spending an additional six hours engaged in study, review, and planning.

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 and concept maps, reflections on authentic teaching experiences with elementary children, and forum discussions.

Course Format

This course is offered in a traditional face-to-face format over an eight-week cycle.

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.

COURSE TIMELINE

Class #1A= (Prior to first class please obtain the texts, downloads and complete the following in order to frontload some of the readings for future classes):

- Read syllabus prior to attending class (what questions do you have??). Print out grade sheet
- In "Teaching Science to Children": Read Science Safety, Ch. 1, 2, Outline, comments and questions. Limit to one page for each chapter
- In the NGSS Standards (<http://www.nextgenscience.org>) Read about the three dimensions used to develop the standards (Practices/Science and Engineering Practices/Core Ideas.. View the Film "Why NGSS". Outline/comments/questions=1 page.

Class #1 B January 23 (Tuesday)

- Introductions/ Define Science? How were you taught Science?
- Introduction to Syllabus (Questions)
- Assign directors (see attached addendum)
- Overview of Next Generation Science Standards (NGSS) assignment #1A, B,C (Assign Groups)
- Moon Journals,
- Science Content Topics in Text (Assign Groups)
- Field Trip/Community Resources (Overview)
- Signups for various projects (DE/Moon Journals/Chapter Readings)
- Introduction to Discrepant Events: What are the critical pedagogical elements of inquiry as used in the Discrepant Event model? (Happy/Unhappy Balls)
- The Nature of Science and the Scientific Method/Learning Cycle (Loonie Goonies Simulation Game)

Next time:

- 1) You have completed readings for Assignment 1A . See syllabus for Descriptions of Assignment # 1 B. Be prepared **to share this lesson** and its components with your grade level/subject group on January 26th when you will prepare a presentation for the rest of the class (note addition of Health Standards 1c). See Description of the Assignments for clarification on writing the NGSS lesson plan.

- 2) In order to familiarize yourself with an NGSS lesson view the film of a science teacher on this link:
<https://www.teachingchannel.org/videos/cross-discipline-lesson-achieve>
- 3) In your assigned reading group choose one Chapter from Ch. 4-6 (Physical Science) to read and produce one graphic organizer and (or) teaching outline to share with reading team/ colleagues to assist in teaching your team about the content of that chapter (see Assignment #9). Assign Reading groups.
- 4) Discrepant Event Presentations x2 per schedule.
- 5) Print out grade sheet for folder.

Class #2 January 24 (Wednesday)

- Discrepant Events X 2(Assignment #2A/B)
- Must have syllabus (General Questions)/ Grade sheet printed for personal folder
- General Discussion of NGSS Standards. Keating PPT “Understanding NGSS” Assign Five Groups
- General Discussion of Friedl Text Introduction, Ch. 1-2 and Share graphic organizer/outline: (Ch. 4-6 Physical Science) (Assignment #7)

Next Time

- 1) Choose one from TSC Ch. 7-10 Physical Science (Graphic Organizer and or outline)
- 2) Discrepant Events x2 (per schedule)
- 3) NGSS Standards presentations: You will have completed your individual components 1A and 1B by next class (overview of the readings and NGSS lesson. See syllabus Descriptions of Assignment # 1 a, b,. Be prepared to share this lesson with your grade level group to assist in preparing a group presentation (time given in class).

Class #3 January 26 (Friday)

- Team NGSS Standards presentations (#1C)
- Student discrepant events x 2 (Assignment #2A/B)
- Share Graphic Organizers Ch. 7-10 (Physical Science)

Next Time

Field Trip to Safari Park (Details in Class)

Class #4-#5 January 30 (Tuesday) Field Trip to Safari Park

AM: Lab in Conservation Center “Hormones as Predictors in Rhino Populations”

PM: Designing an Animal Observation Study as an Inquiry Lesson

Next Time:

- 1) Choose one from TSC Ch. 11—13 Physical Science and Earth Science (Graphic Organizer)
- 2) Discrepant Events (per schedule)
- 3) Introduction to Inquiry Based Problem Solving: Assignment #6A Odyssey of the Mind Program overview: “Superlinks”
- 4) Open Ended Science Experiments (Paper Towel Experiment) Assignment #4

Class #6-#7 February 7 (Wednesday)

AM:

TSC Ch. 11—13 Physical Science and Earth Science (Graphic Organizer)
Discrepant Events (per schedule)

PM:

Introduction to Inquiry Based Problem Solving: Assignment #6A Odyssey of the Mind Program overview: “Superlinks” Level 2 Inquiry
Overview of Invention Convention Assignment #6 (Level 3 Inquiry)
Open Ended Science Experiments (Paper Towel Experiment) Assignment #4

Next Time:

- 1) Share Graphic Organizers Ch. 14-17 Earth Science
- 2) Discrepant Events X 2 per schedule
- 3) Cooperative Learning Problem Solving Game Assignment #6 B “Verbal-Non-Verbal Communication” (Level 2 Inquiry)

Class #8 February 13 (Tuesday)

- TSC Ch. 14-17 Life Science (Graphic Organizer)
- Discrepant Events X2 per schedule
- Verbal Non-Verbal Communication Game (Assignment #6B)

Next Time: Class #9 and #10 are independent study sessions

Class #9 February 16 (Friday PM) Independent Study in 5102

- Work in teams on Moon Journals, Invention Convention, Social Studies ITU

Class #10 February 23 (Friday PM)

- Work in teams on Moon Journals, Invention Convention, Social Studies ITU

Next Time:

- 1) Discrepant Events per schedule X 2
- 2) TSC Ch. 18-21 (Life Science)

Class #11 February 27 (Tuesday PM)

- Discrepant Events per schedule X 2
- TSC Ch. 18-21 (Life Science)
- Open Ended (inductive) labs “Paper Towel Experiment

Next Time:

- 1) Discrepant Event X2 per schedule
- 2) Moon Journal Presentations Group 1

Class #12 March 2 (Friday PM)

- Discrepant Event X2 per schedule
- Moon Journal Presentations Group 1

Next Time:

- 1) Discrepant Event X2 per schedule
- 2) Moon Journals Group 2
- 3) Interview Questions
- 4) Social Studies Overview by Group

Class #13-#14 March 6 (Tuesday AM/PM)

AM:

- Discrepant Event X2 per schedule
- Moon Journals Group 2

PM:

- Interview Questions
- Social Studies ITU overview by group

Next Time:

- 1) Discrepant Event Quiz (Assignment #2 C)

- 2) Instructor evaluations
- 3) Interview Questions
- 4) Invention Convention Presentations

Class #15 March 13 (Tuesday PM)

- Discrepant Event Quiz (Assignment #2 C)
- Invention Convention Presentations
- Instructor evaluations
- Interview Questions

Description of Science Methods Assignments

The following are assignment prompts that represent the Spirit of the Assignment. Additional information and clarification will be given in class. Handouts and other resources will be provided on EDMODO. Each assignment will be scored using some form of rubric that uses a Likert Scale. Due dates are on the timeline of this syllabus.

Note: I = Individual Assignment and T = Team Assignment

Assignment 1 – Next Generation Science Standards (NGSS)

Spirit of the assignment: You will be assigned sections from the NGSS standards to write about, comment and ask questions. You will create your own individual lesson plan that applies the three dimensions of NGSS standards. You will have time in class to share both your understanding of the readings as well as your lesson with your assigned subject team (Health, Physical, Life or Earth Science). Then you will work with your subject level team to prepare and do a presentation to the class consisting of one of the lessons (with your modifications) as well as a general overview of core ideas in that subject curriculum. It's important that you do the reading and the lesson write-ups BEFORE you meet with your team.

1a. Framework summary response (I) 10 points

- See Course timeline for Class 1A for the readings and videos related to NGSS that you will respond to.
- Write about a page that at least in part addresses these questions: What do you think are the most important ideas addressed in the reading? Were there any ideas in the reading, which were very new to you? What questions do you have?

1b. Grade level Science Lesson response (I) - 10 points

- Read through all the standards for your assigned subject/grade level. Using the standards for your chosen subject area (each grade typically covers one science area), pick a line item from physical science, or life science, or earth science or health (jigsawed so that each science content area is covered by different teams). Identify a specific standard (**section one**) and write up a brief description of an activity that children exploring will come to an understanding of the standard (it should be inquiry based to some degree). For sample lessons, there are a number of examples on the Internet. One of many great reputable new resources that you might use is the following web site which includes award winning lessons that apply the standards in this way and also use technology: <http://www.nsta.org/publications/interactive/laptop/grade.htm>
- **Your lesson should end up with four sections in all** (two are described above i.e. content standard and activity), **The third section** should include how some elements of the Three Dimensions of NGSS might be incorporated. (See physical science example below): 1) **Cross Cutting** = such as Connections to Technology; Connections to Engineering and Connections to language arts, social science and mathematics (or other disciplines). To clarify these complex interactions **themes** are used to link them such as Patterns, Similarity/Diversity, Cause and Effect, Structure and Function, Energy and Matter, Stability and Change, Systems and Models 2)

Practices (Behaviors used in Inquiry) in Science and Engineering Processes such applying the scientific method (or 5E model) in Science and (or) modeling, construction and testing in Engineering. This also would include what cognitive (ways of learning), social (interactions) and physical practices (tools) it requires. 3) **Disciplinary Core Ideas** which big concepts are suggested for the four domains of Biology, Physical Science, Earth Science and Engineering. This also include what curriculum, instruction and assessments might be linked to it as well as why students lives' and interests are connected. The **fourth section** should describe a simple formative or summative assessment (or both) that could be used for that specific activity. The entire lesson should not exceed one page.

- See example below illustrating these four sections in a Physical Science lesson.

1b. Grade level Health Education standards response

Grade level Health Education Content Standards Response (I) – 5 points

[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.

If you are assigned to health for your grade level/subject area on your team for Task I B, you will select one Health Content Standard and include the four sections discussed above for the Science Standards.

1c. Team preparation and presentation (T) 5 points

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

- Get together with your team (subject area and grade level typically (Biology/Life Science= 6th grade; Earth Science = 7th grade and Physical Science= 8th grade). Health Science has topics for 6th-8th also under their standards. Briefly discuss your readings/responses to the NGSS or Health standards (1a). Discuss at the lessons that everyone wrote up for Assignment 1b. **Choose one.**
- As a team, visually **write up this lesson plan with modifications suggested by the team**. This modified version should include elements from the four sections described in 1b. Put it on chart paper or on a PPT or equivalent.
- As a team, besides the modified lesson plan, include a **brief overview of the Science or Health Standards for your grade**. Don't try to give us every single line of the standard. Summarize it in such a way that it is clear what expectations are for students to learn in physical, earth, life science and health in Middle level.
- In 8 minutes or less, present your lesson plan and overview of the standards in your subject area. Be prepared to defend why your lesson plan represents really good science for students and answer any questions from the audience.
- Your evaluation for this assignment will be based on the content and quality of your presentation (and completion of all tasks), as well as the level of collaboration of the group in both discussions and presentation.

Sample Lesson responses to Assignment 1b. and 1c.

Grade Eight
Physical Science

1.b. 1) **Standard:** NGSS Standard (Under MS-PS 2 Forces and its Interactions) MS-P2-3= Factors affecting the Strength of electric and magnetic forces.

Students will learn how to build a simple compass and use it to detect magnetic effects, including the Earth's magnetic field and be able to explain this mechanism.

2) Activity

Following directions from the Internet, the students will work in partner pairs to build compasses, using paper cups, thread, a needle and a magnet. They will observe and record the action of the compass indoors and outdoors, and see effects while in proximity to various objects. They will compare this to the use of a GPS device (non-magnetic). Discussions within teams and as a whole class will lead to understanding of principles of magnetism and how they can be applied to an invention (compass). Other potential related activities might include: History of the compass and its use; You-Tube videos on magnetism and its effects; presentations of DE related to magnetism.

3) Connections to three dimensions of the NGSS Standards:

1) **Cross Cutting:** Technology: Demonstrate the use of a GPS device that like the compass assists finding location but does not use the magnetism of the earth. Engineering: Discuss how the construction of the compass (shaping the needle compass, size of the floatation materials and material to float it on affects the quality of the compass). Connections to LA and Mathematics: Students will explain and or write a narrative on how they built it and what issues they had in construction as well as how it works (LA). The scale and materials use will determine the effectiveness of the compass/ magnetic effect (math). Themes: (Structure and Function).

2) **Practices:** Engineering (modeling, testing, construction); Science (hypothesis, design, experimenting and analyzing). Applying cognitive (exploration and inquiry in teams leads to understanding principles of magnetism. Other behavioral considerations include Physical (Using tools), Cognitive (Learning through multiple strategies such as inquiry, social discourse, visual (video) and social (working in cooperative teams)

3) Core Ideas (DCI): Connected to the Standard described above. This should also validate why this topic is both important and of interest to students of this age and grade (motivation).

4) Assessment (summative): The student will be able to draw and label and explain orally how s/he built the compass and how it used and applied in a magnetic field (a rubric will be used to assess the level of understanding). An additional formative assessment should be given for completion/participation in all tasks in the cooperative team (based on a rubric and timeline).

Assignment 2 A/B/C – Discrepant Event

Spirit of the Assignment: Develop and teach a particular kind of a science inquiry lesson that teaches both science thought processes and science content. You will practice your discrepant event on at least one school-age child and reflect on the child's responses and what they indicate about how much he/she understood. Working by yourself or with a partner you will actually present your discrepant event to the class and give a copy of the lesson plan to each class member. After all the discrepant events have been presented, you will take a quiz to demonstrate that you personally learned the important science concepts that were presented. **For extra credit you can present your DE in your CT classroom (10 pts)**

2a. Discrepant Event Lesson Plan and Presentation T 15 points

- Working in a team or two, find a discrepant event associated with one of the reading topics you will do in the textbook (Friedl). You can get one from the Text (Friedl) or Discrepant Events, by Keating, or go to a bookstore or the children's section of the library and look for books on Science Tricks, or Science Magic.
- Get together the materials needed for the discrepant event.

- Practice doing the event.
- Make sure you understand the science behind the event. If you got it from an Internet website, there may be background info on the site. Another good place to look: the children's section of the public library. Find children's books on the topic in addition to or even preferably to books for adults. The children's books will explain things simply and will use the appropriate vocabulary for you to use with your students. Remember, you don't have to have a college-level understanding of the topic, just have good, accurate information at your students' level.
- Do your discrepant event with at least one school-age child or a classroom group and take careful notes on the child's responses. (This ties in with Assignment 2b i.e. Discrepant Event journal.)
- Include two questions that can be included in the DE quiz at the end of the course
- On your assigned day, bring in your materials and equipment and do your discrepant event for/with the class. **You are limited to 15 minutes presentation time (with about 5-10 minutes for discussion/evaluation).**
- After presenting your event, give or email each member of the class a copy of the lesson plan.
- Turn in your lesson plan, the questions (to the DE coordinator), and your individual journal.

2b. Discrepant event journal | 10 points

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

2c. Discrepant event quiz | 20 points

After all discrepant events have been presented in class; a quiz will be given on the content of the events. The quiz is based mostly on the questions submitted by each partner pair. *This quiz will be open notebook. That means you should take careful notes during each discrepant event presentation.*

ASSIGNMENT # 3 A/B– OBSERVATION/ART/WRITING (INTEGRATING MULTIPLE DISCIPLINES WITH SCIENCE INQUIRY)

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

3a. Observation | 5 points

- Sign up in pairs or triads for a particular day (Writing/Art Activity), from 1 to 28 in the Moon Journals book. Look at the Art Invitation and the Writing Invitation for your particular day. The Moon Journals director will assist in copying the relevant pages.
- Observation is a critical part of science and teaching science to children. To that end observe a natural event and take notes. Try to identify as many specific details by using multiple senses. Your notes or sketches can be in any format, and can be handwritten. If there is one sense that can't be used for your observation, give the reason why. You will turn in your science observation notes with the art and writing pieces.

3b. Art and Writing Integrated into Science | 15 points

- Follow the directions in the Moon Journals book for the prompt for writing and art activity that you choose (Each activity number links an Art to a Writing prompt). Apply the specifics of your science observations as creatively as you can to both the writing and art prompt. As an alternative to this have a child apply an observation to the art and writing and present that as your artifact.

- B. Each team (using the same prompts but not necessarily the same science observation) will explain their observations and how they applied them to the Art and Writing Prompt.
- C. REMEMBER—YOU ARE NOT GOING TO DO YOUR WRITING AND ART ABOUT THE MOON. THIS IS AN ADAPTATION OF THAT. YOU ARE GOING TO USE WHAT YOU OBSERVED, WHETHER IT'S WALKING ON THE BEACH OR BATHING A BABY ETC.

Assignment # 4 – Using experiments that are open-ended, inquiry based and inductive “The Paper Towel Experiment”

Spirit of the Assignment: Teachers will apply their knowledge of the Scientific Method and 5E Inquiry model to design an experiment that will address a problem, control variables, collect and analyze data then present (and rebut) findings to the class. This activity will reinforce knowledge of how science works as well as applying communication, debating and explanation skills (all part of the NGSS Standards). The value of this inductive approach vs. the typically used deductive approach will be discussed in class as well as various ways to implement this Level 2-3 Inquiry Model with Middle School students. **10 Pts.** (Done in class)

Assignment #5 The logistics of how to organize and create inquiry based Field Trips in Science (Safari Park Field Trip)

Spirit of the assignment: *by attending this field trip students will understand: 1) general procedures for planning an implementing a field trip in science; 2) how to access and use resources provided by a site prior to going; 3) how to develop a Pre, during and post lesson plan that applies an inquiry based model (in this case an animal observation study. 4) Experience in doing an Inquiry Based Lab that could be used with Middle School Students (Conservation Center)* (15 pts.)

Assignment #6 (A – C): Inquiry-Based Problem Solving/Teaching Model

Spirit of the Assignment: Three different examples of applying inquiry in a Middle School Classroom. Reinforces the Discrepant Event Model (30 Pts)

- A. Odyssey of the Mind: “Superlinks” (Individual Problem Solving/Competitive-Non-Competitive Model) – Level 2 Inquiry= 5 pts
- B. “Verbal Non-Verbal” (Level 2 Inquiry Group Problem Solving) - 5 pts
- C. “Invention Convention” (Applied Inquiry) - 20 pts

Assignment #7 Applying Readings to the Understanding of Science Topics/ Content for Middle Level Teachers (Book Report Groups)

Spirit of the Assignment: Gain a basic understanding of the major scientific concepts taught in K-6 from Earth Science, Biology, Chemistry and Physics. Each week students will read one of the three or four topic areas (Chapters) of science content and pedagogy assigned that week from Friedl/Koontz.

- 1) They will formulate a graphic organizer/outline, demos, visuals, manipulates to assist in explaining the major concepts, critical vocabulary and examples of DE/Demonstrations that apply.
- 2) They will meet with their group to jigsaw each of the assigned chapters.
- 3) They will incorporate some form of formative assessment to evaluate understanding.
- 4) In a general class discussion they will pose any additional questions or issues related to the topics discussed.
- 5) The Discrepant Events for that class period will attempt to be coordinated with the topics of that day so they are representative (10 pts each X 6 = **60 pts**)

Assignment #8 Participation/Attendance in all aspects of class work

Spirit of the Assignment: Attendance/Participation in each class through discussions, questioning and group involvement X 15 (75 pts).

Assignment # 9 Social Studies interdisciplinary unit plan (ITU)

Spirit of the Assignment: Integrate science into a Social Studies Unit Plan. Try to incorporate some of the strategies/curriculum that we discussed and used this class to demonstrate how to integrate science into the curriculum. (20 pts.)

EXTRA CREDIT

All students can gain extra credit for certain in-class and out-of-class activities. *Five examples are provided below.*

- Apply your Discrepant Event with the class you are tutoring/teaching (10 pts.)
- **Read a scientific article(s)** concerning science or science education and write a one-page reaction paper on each article. Articles must be a relatively current publication date. They can be from scholarly journals, or ERIC, from the Internet, from the newspaper, or from general interest publications. Please make sure to include the Author, Title, Publication Name, and Date of Publication.
2 points per article (maximum two articles)
- **Watch a television show or movie** that deals with science or science education and write a one-page reaction paper. (Maximum **two reports** (2 points per report))
- **Be a director**, according to the list below. 5 points
- **Attend a Science conference or workshop (5pts)**

List of Potential Classroom Directors (may include 1-2 people)

- Director of Directors – Assigns Directorships – keeps list
- Classroom note-taker: organizes succinct summary of major ideas of each class and distributes electronically
- Discrepant Event Coordinator
- Moon Journal Coordinator,
- California Frameworks Coordinator
- Technology coordinator—assists with use of smart classroom to facilitate student presentations
- Timer ...Keeps student/instructor presentations on time
- Assignment Folder coordinator---collects and hands out grade folders and papers before and after class
- Environmental coordinator---makes sure classroom environment is appropriate both before and after class
- Name Tag Director – Make sure everybody has a name tag each class
- Contact Information Director—Make class list with current contact info including emails/phone numbers
- Assignment coordinator—sends out weekly reminders of assignments due and clarification with instructor if needed
- Photographer – takes photos of students (for folders) and various class activities. Shows them to class.
- Science Education researcher– Find science/science education websites and news articles that are relevant and send to and or present to class
- Field Trip Coordinator—Helps with arrangements to the Safari Park
- Science Methods Text (Friedl) Topic Area Assignments
- Other (you choose depending on your expertise and needs of the class)

Addendum A Grade Sheet (Please copy and bring to class for folder)

Grade sheet – EDM1 545 Name _____

Assignments:

1a.	Framework Reading Response Write-up	_____/10
1b.	NGSS or Health Lesson Write-up	_____/10
1c.	NGSS Lesson Team Presentation	_____/5
2a.	Discrepant Event Lesson Plan and Presentation	_____/15
2b.	Journal—Doing your discrepant event with a child	_____/10
2c.	Discrepant Event Quiz – Open notebook	_____/20
3a.	Observation of natural event (Moon Journal(_____/10
3b.	Art/Writing Project (Moon Journals)	_____/20
4	Open-ended experiments (inductive/inquiry based)	_____/10
5	Using Field Trips/community in Science (Safari Pk.)	_____/15
6	Problem Solving x 3 (OM/Verbal_NV/ Inv.Conv)	_____/30
7	Assigned Reading Topic from Friedl TSC (6 X)	_____/60
Chapters 1,2,	____+____+____+____+____+____=	
8	Attendance/Participation Credit (Discussion/presentations/etc.) x 5	_____/75
9	Social Studies ITU (Science Integration)	_____/20

Extra/Additions ____/

Total ____/310

Addendum B Discrepant Evaluation Rubric Sheet

Name:

DISCREPANT EVENT EVALUATION FORM

1) **Organization:** Is the handout clear and inclusive of all necessary information to duplicate and are the materials relatively easy to find and use? What NGSS standard and (or) concept addressed? (2.0)

2) **Content:** In the presentation and explanation does the teacher appear to have a good grasp of the underlying scientific principles/concepts/DCI? (2.0)

3) **Pedagogy:** Does the discussion/demonstration of the DE model:

A) Good inquiry methods (uses cognitive dissonance to develop schema):

- Probing open-ended questions/clarifications
- Non-judgmental and positive responses
- Student centered vs. teacher centered (only appropriate and necessary clues used)
- Integrates science processes (prediction/designing experiments/observation/data gathering/analysis/communication)
- Effective closure/assessment
- Addresses potential applications from student experiences

B) Generation of student enthusiasm/interest/on-task

C) Application of NGSS standards (specifically) (4.0)

4) **Inclusive:** Is the discrepant event appropriate for linguistically diverse students (ELL)/ are they involved in the process? (2.0)

5) **Strengths and Recommendations:** What are the overall strengths and what recommendations for improvement do you have?

Comments:

Dr. Joseph Keating, Science Methods, CSU-San Marcos, 9/1/17