Originating Course Information

Offering of Education: Teaching & Learning 5722: Methods in Teaching STEM Secondary Science II
Fiscal Unit/Academic Org School of Teaching & Learning - D1275
Requirement/Elective Designation Not A General Education course

General Information

Type of Request Flexibly Scheduled
Term of Offering Autumn 2012 - Regular Academic Term
Level/Career Graduate
Previous Value Graduate, Undergraduate
Rationale for proposing this offering A new course version is being developed as a part of the Woodrow Wilson Ohio Teaching Fellowship program here at OSU. This course adds two objectives to the existing 3 credit course. 1. Provide necessary content in science areas outside the students previous degree. 2. Provide in depth content pedagogy in the area of the students previous degree.
Description for this offering This course is designed to increase preservice teacher pedagogical content knowledge. Scientific inquiry and content integration will be applied within the context of specific topics and knowledge domains through preparing activity based lessons.

Attachments

• 5722Supplement.doc: One Time Form Supplement
  (One Time Form Supplement. Owner: Post, Paul Erich)
• 5722 Methods in Teaching Science II WWOTF.doc: Syllabus
  (Syllabus. Owner: Post, Paul Erich)

Comments

• Approved by GSC. (by Mercerhill, Jessica Leigh on 04/20/2012 02:17 PM)
• This course will be offered the same quarter as the 3 credit version.

The readings will be developed by the WWOTF committee’s science and engineering members. The assessments are also being developed. (by Post, Paul Erich on 04/20/2012 02:14 PM)

Workflow Information

<table>
<thead>
<tr>
<th>Status</th>
<th>User(s)</th>
<th>Date/Time</th>
<th>Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submitted</td>
<td>Post, Paul Erich</td>
<td>04/20/2012 02:14 PM</td>
<td>Submitted for Approval</td>
</tr>
<tr>
<td>Approved</td>
<td>Mercerhill, Jessica Leigh</td>
<td>04/20/2012 02:17 PM</td>
<td>Unit Approval</td>
</tr>
<tr>
<td>Pending Approval</td>
<td>Achterberg, Cheryl L Blount, Jackie Marie Zircher, Andrew Paul</td>
<td>04/20/2012 02:17 PM</td>
<td>College Approval</td>
</tr>
</tbody>
</table>
A. One-time Request Information (This section is required for all one-time offering requests)

1. Requested Room Capacity (if university pool classroom is being requested) 20

2. Enrollment Capacity 20

3. Waitlist Capacity 5

4. Final Exam:
   - [ ] Yes  [ ] No
   - [ ] Last Class (Note: per faculty rules, this option is NOT available for the Undergraduate career)
     
     a. Exam Seat Spacing 20

5. Special Instructions or Additional Information

6. Class Search Title (18 character limit) STEMSciMethods 2WW

7. Display in Class Search:
   - [ ] Yes  [ ] No

8. Credit Hours 5

9. Course Components (check all that apply):
   - [ ] Clinical
   - [ ] Field Experience
   - [ ] Independent Study
   - [ ] Laboratory
   - [ ] Lecture
   - [ ] Recitation

10. Graded Component (check one):
    - [ ] Clinical
    - [ ] Field Experience
    - [ ] Independent Study
    - [ ] Laboratory
    - [ ] Lecture
    - [ ] Recitation

11. Campus of Offering (check all that apply):
    - [ X ] Columbus
    - [ ] Marion
    - [ ] Newark
    - [ ] Lima
    - [ ] Mansfield
    - [ ] Wooster (ATI)
12. Prerequisites and Exclusions

13. Permission to Enroll in this course:  
   □ No Consent needed  □ Department Consent
   □ Instructor Consent

14. General Education Details (if applicable): Attach GE model curriculum compliance statement and GE course assessment plan.

B. Group Studies Request Information (This section is required for group studies requests only)

1. Previous quarters of offering and enrollment (Regular course numbers should be sought for group studies courses taught three times with success).

2. This course has been discussed with and has the concurrence of the following academic units needing this course or with academic units having directly related interests (list units here and attach letters indicating concurrence or objection from academic units that might have jurisdictional interests).

3. Attach the course syllabus that includes the topical outline of the course, student learning outcomes and/or course objectives and methods of evaluation.

C. Flexibly Scheduled/Off Campus/Workshop Request Information (This section is required for flexibly scheduled / off-campus / workshop requests only)

1. Start Date and End Date  August 22 – December 4, 2012

2. Previous quarter(s) of offering and enrollment First offering

3. Expected enrollment for proposed quarter of offering 15

4. Attach the course syllabus that includes the topic outline of the course, student learning outcomes and/or course objectives, methods of evaluation and off-campus field experience.

5. Off-Campus Site  NA

6. Will course be taught in distance learning format:  □ Yes  □ No
7. Complete the following for courses offered for less than term length or for Workshops:

<table>
<thead>
<tr>
<th>Level and Credit Hours:</th>
<th>Present Offering</th>
<th>Proposed Offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class/Lab Contact Time:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prerequisites:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusion or Limiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade Options (Check)</td>
<td>Letter S/U Progress</td>
<td>Letter S/U Progress</td>
</tr>
<tr>
<td>Number of Hours of out-of-class preparation required:</td>
<td></td>
<td>Total hours of class meetings:</td>
</tr>
</tbody>
</table>

8. Complete this section for Off-Campus courses only:

Distribution of contact time (explain differences from on-campus offerings):

__________________________________________________________________________

Instructor ____________________________ Rank ____________________________

Qualifications (explain any difference in rank/qualification from on-campus instructors)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Explain differences in teaching arrangements from on-campus offerings

__________________________________________________________________________

__________________________________________________________________________

Student Services (explain how they will be provided to off-campus students):

Registration ____________________________

Office Hours ____________________________

Academic Advising ____________________________

D. Study Tour Request Information (This section is required for study tour requests only)

1. Previous quarters of offering and enrollment:

__________________________________________________________________________

2. Expected enrollment for proposed quarter of offering:

__________________________________________________________________________
3. This request has been discussed with and has the concurrence of the following academic units needing this study tour or with academic units having directly related interests (list units and this course has been discussed with and has the concurrence of the following academic units needing this course or with academic units having directly related interests (list units here and attach letters indicating concurrence or objection from academic units that might have jurisdictional interests):  

4. Attach the academic plan that includes student learning outcomes and/or course objectives, topical outline and percent of time spent on each topic, methods of instruction, course requirements, methods of examination and percent of the final grade each method constitutes, textbooks and/or reading lists, admission procedure, orientation and debriefing plans and method of dealing with any expected language barriers.

5. Attach the administrative plan for the study tour that includes an itinerary, arrangements for travel, housing, meals, classrooms, excursions, and budget.

ATTACHMENT TYPES that may be needed for this form:

Cover Letter  
Syllabus  
Study Tour Academic Plan  
Study Tour Administrative Plan  
Concurrence Letters / Forms  
GE model curriculum compliance statement  
GE course assessment plan  
Memo of Understanding  
Appeal statement  
Other supporting documentation
Begin Component 1

1. Component (Section) Type (Choose 1):
   [ ] Clinical
   [ ] Field Experience
   [ ] Independent Study
   [ ] Lab
   [X] Lecture
   [ ] Recitation
   [ ] Seminar
   [ ] Workshop

2. Instruction Mode. (Choose only ONE):
   [ ] Clinic Field Experience
   [ ] Computer taught
   [ ] Distance Learning
   [X] In Person
   [ ] Video Taught

3. Meeting Pattern
   [ ] MON [X] TUE [X] WED [ ] THR [ ] FRI [ ] SAT [ ] SUN

4. Meeting start time: 4:30 PM
5. Meeting end time: 6:48 PM

6. Instructors. Provide at least 1 primary instructor.

<table>
<thead>
<tr>
<th>Instructor Name</th>
<th>Role</th>
<th>Access</th>
<th>Print name in schedule?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irving.8</td>
<td>Primary</td>
<td>Instructor</td>
<td>Yes</td>
</tr>
<tr>
<td>Lee.3552</td>
<td>Instructor</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

7. Central classroom pool facility or department room: [ ] Pool [X] Dept

8. Room Characteristics. Specify up to 5 in priority order.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Science Lab Preferred</td>
</tr>
<tr>
<td>2</td>
<td>Full AV equipment available</td>
</tr>
<tr>
<td>3</td>
<td>In Arps</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

9. Notes: Should be in 286 Arps on Wendnesday. As nearby in Arps as possible on Tuesdays
   Could be a pool room on Tuesdays

   ___________________________________________________________

   9a. Notes print location relative to class listing: [X] Do not Print [ ] Before [ ] After

End Component 1
1. Component (Section) Type (Choose 1):
   [ ] Clinical
   [ ] Field Experience
   [ ] Independent Study
   [ ] Lab
   [ ] Lecture
   [ ] Recitation
   [ ] Seminar
   [ ] Workshop

2. Instruction Mode. (Choose only ONE):
   [ ] Clinic Field Experience
   [ ] Computer taught
   [ ] Distance Learning
   [ ] Flexibly Scheduled
   [ ] In Person
   [ ] Video Taught

3. Meeting Pattern
   [ ] MON [ ] TUE [ ] WED [ ] THR [ ] FRI [ ] SAT [ ] SUN

4. Meeting start time: ___________
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</tbody>
</table>

9. Notes: ______________________________________________________________
______________________________________________________________
______________________________________________________________

9a. Notes print location relative to class listing: [ ] Do not Print [ ] Before [ ] After
1. Component (Section) Type (Choose 1):
   - [ ] Clinical
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   - [ ] Independent Study
   - [ ] Lab
   - [ ] Lecture
   - [ ] Recitation
   - [ ] Seminar
   - [ ] Workshop

2. Instruction Mode. (Choose only ONE):
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   - [ ] Computer taught
   - [ ] Distance Learning
   - [ ] Flexibly Scheduled
   - [ ] In Person
   - [ ] Video Taught

3. Meeting Pattern
   - [ ] MON [ ] TUE [ ] WED [ ] THR [ ] FRI [ ] SAT [ ] SUN

4. Meeting start time: ___________ 5. Meeting end time: ___________

6. Instructors. Provide at least 1 primary instructor.

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<td>4</td>
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</tr>
</tbody>
</table>

9. Notes: ______________________________________________________________
    ______________________________________________________________
    ______________________________________________________________

9a. Notes print location relative to class listing: [ ] Do not Print [ ] Before [ ] After
Edu T&L 5722
Methods in Teaching Secondary Science: II WWOTF version
The Ohio State University
College of Education and Human Ecology
School of Teaching and Learning
Autumn Semester, 2012

Time: 4:30 - 6:48 PM., Tuesdays; 4:30 to 6:48 Wednesdays
Location: Arps Hall
Credit Hours: 5

Preparing Educators…Our Mission
The mission of the educator preparation unit of The Ohio State University is to prepare educators, through the generation and use of research, who are highly qualified for and who are passionate about maximizing student learning across all P - 12 school age and demographic groups.

Instructors
Dr. Karen E. Irving
285A Arps Hall
Telephone: 614-292-1229
Soonchun Lee
258 Arps Hall
614-688-3725

Office hours:
2:00 - 3:30 PM Tuesday
Other by appointment
E-Mail: irving.8@osu.edu
2:00 – 4:00 PM Thursday
Other by appointment
E-Mail: Lee.3552@osu.edu

Course Goals: This course is designed to increase preservice teacher pedagogical content knowledge associated with topics identified as essential by the National Science Education Standards, the Frameworks, the Common Core Science Standards and other reform documents. Further, the general principles of scientific inquiry and content integration will be applied within the context of specific topics and knowledge domains. The course will also provide direct experiences with activity-based lessons that students can use with students in grades 7-12.

Upon satisfactory completion of this course students will be able to:

a) Describe and participate in various methods of in physics, chemistry, life science, earth and space sciences and engineering.
b) Understand and implement scientific and engineering practices to meet instructional goals in physics, chemistry, life science, earth and space sciences and engineering.
c) Describe and demonstrate various teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding in physics, chemistry, life science, earth and space sciences and engineering.
d) Design a unit plan and assessment strategy related to state and national standards to include both formative and summative aspects.
e) Use educational technology resources for inquiry learning and for resources.
f) Address issues of safety in lesson plan design.
g) Describe explicit plans to address the needs of diverse students in the science classroom.

NCATE Standards Addressed:

Standard 3. Inquiry. Teachers of science engage students both in studies of various methods scientific inquiry and in active learning through scientific inquiry. They encourage students individually and collaboratively to observe, ask
questions, design inquiries, and collect and interpret data in order to develop concepts and relationships from empirical experiences. To show that they are prepared to teach through inquiry, teachers of science must demonstrate that they:

3.a. understand the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge; and
3.b. engage students successfully in developmentally appropriate inquiry that require them to develop concepts and relationships from their observations, data and inferences in a scientific manner.

Standard 5. General Skills of Teaching. Teachers of science create a community of diverse learners who construct meaning from their science experiences and possess a disposition for further exploration and learning. They use, and can justify a variety of classroom arrangements, grouping, actions, strategies, and methodologies. To show that they are prepared to create a community of diverse learners, teachers of science must demonstrate that they;

5.a. vary their teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding;

Standard 6. Curriculum
The program prepares candidates to develop and apply a coherent, focused science curriculum that is consistent with state and national standards for science education and appropriate for addressing the needs, abilities and interests of students. Science curriculum refers to an extended framework of goals, plans, materials, and resources for instruction and the instructional context, both in and out of school, within which pedagogy is embedded.

6.a. Develop coherent, meaningful goals, plans, and materials and find resources.
6.b. Relate plans and resources to professionally developed state and national standards, including the National Science Education Standards.
6.c. Plan and develop science curriculum addressing the needs, interests and abilities of all preK-12 students.

Standard 8. Assessment
The program prepares candidates to use a variety of contemporary assessment strategies to evaluate the intellectual, social, and personal development of the learner in all aspects of science. Assessment refers to the alignment of goals, instruction and outcomes; measurement and evaluation of student learning in a variety of dimensions and the use of outcome data to guide and change instruction.

8.a. Align science goals, instruction and outcomes.
8.b. Know and use a variety of contemporary science assessment strategies to determine preK-12 student needs and levels of learning and development.
8.c. Use assessment appropriately to determine, guide and change science instruction.

Required Texts:

Required materials: USB Flash drive (4 Gigabyte minimum capacity)

Suggested materials: Wireless enabled laptop computer; OSU wireless account.
http://cio.osu.edu/communications/guide/student/internet_access.html

Recommended Resources:
3) The Ohio Resource Center, http://www.ohiorc.org/. ORC enhances teaching and learning by promoting standards-based best practices in mathematics, science, and reading for Ohio schools and universities. ORC serves as a trusted source of easily accessible, peer-reviewed, high-quality, and effective resources.


Course Requirements/Evaluation

Attendance/Participation Policy: Attendance and participation in all classes is expected. Please note that absences, tardiness, and/or lack of appropriate participation throughout the course may result in grade reduction. Should an impending absence be unavoidable, please notify Dr. Irving through e-mail to arrange make-up assignments.

Attendance and Informed Participation

This course is deliberately designed to be highly interactive, with students participating in discussions and engaging in collaborative activities. The expectation is that students will have prepared for each session by completing the required readings and relevant assignments prior to each session, enabling full participation and informed contributions to each discussion and activity.

Assessing Student Learning using Student Work Samples  #1, #2 (practice TPA task 3)

The Assessment of Student Learning task asks you to assess student achievement, diagnose student learning strengths and needs, and develop strategies to use this information to inform instruction. You will provide evidence of your ability to 1) develop evaluation criteria that are aligned with your big idea or essential question, standards, and learning objectives; 2) analyze student performance on an assessment in relation to student needs and the identified learning objectives; 3) provide feedback to students; and 4) use the analysis to identify next steps in instruction for the whole class and individual students. See handout for further details.

Mid-Term Project

Students will gather data in the autumn related to their research project (identified and approved by their mentoring triad). The data will be analyzed and presented to the mentoring team for evaluation. Individual mentoring teams will decide the criteria for success related to this mid-term project.

Science Unit & Assessments (NCATE assessment)

Each student will complete a unit plan that includes formative assessments for each learning objective. See handout for further description. Students will indicate their policy regarding students with disabilities in secondary and middle school classrooms. Students will include at least one inquiry style lesson in the unit.

Each student will create an assessment bank of items designed to assess specific learning objectives for a science teaching unit of his/her choice. The assessment bank will include multiple choice items, matching items, problems, short answers, essay questions, and other assessment options as identified as appropriate for the unit objectives. Items will be identified by Bloom’s level and learning objective. Sufficient items will be included to create at least two different but equivalent summative assessments for the unit. Formative assessment items for each objective will also be included in the test bank. See handout for further description.

Reading Reflections

Every week that reading assignments are due students are expected to submit at least a one page reflection on the reading on their individual blog. The reflection must be sufficiently detailed to convince a reader that the assigned text has been read and considered thoughtfully. The document may be single or double spaced but should be a full page in length (minimum).

Final Exam

A written final examination will be given during the time announced in class.
Summary of Assignments:

<table>
<thead>
<tr>
<th>Name</th>
<th>Due Date</th>
<th>Grad Pts</th>
<th>Grad %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Attendance &amp; Participation</td>
<td>5 points per week</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2 Assessing Student Learning – examining student work 1</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>3 Assessing Student Learning – examining student work 2</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>4 Mid Term Project</td>
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<td>100</td>
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</tr>
<tr>
<td>5 Science Unit &amp; Assessments</td>
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<td>200</td>
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</tr>
<tr>
<td>6 Reading reflections</td>
<td></td>
<td>150</td>
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<tr>
<td>7 Final Exam</td>
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<td>250</td>
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<tr>
<td>Total</td>
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<td>1000</td>
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Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100%</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
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<tr>
<td>B</td>
<td>83-86</td>
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<tr>
<td>B-</td>
<td>80-82</td>
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<tr>
<td>C+</td>
<td>77-79</td>
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<tr>
<td>C</td>
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<tr>
<td>D+</td>
<td>67-69</td>
</tr>
<tr>
<td>D</td>
<td>60-66</td>
</tr>
<tr>
<td>E</td>
<td>59% or less</td>
</tr>
</tbody>
</table>

Policies for Missed Exams/Quizzes – Students should contact the course instructor for make-up of missed work.

Academic Misconduct – The Ohio State University’s *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the University, or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University’s *Code of Student Conduct* is never considered an “excuse” for misconduct. If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University’s *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University. For additional information, see the Code of Student Conduct. [http://studentaffairs.osu.edu/resource_csc.asp](http://studentaffairs.osu.edu/resource_csc.asp)

Office of Disability Services Statement – Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructor privately as soon as possible to discuss specific needs. The Office of Disability Services is relied upon for assistance in verifying the need for accommodations and developing accommodation strategies. Please contact the Office for Disability Services at 614-292-3307 (V) or 614-292-0901 (TDD) in room 150 Pomerene Hall to coordinate reasonable accommodations; [http://www.ods.ohio-state.edu/](http://www.ods.ohio-state.edu/). Students will be expected to follow Americans with Disabilities Act Guidelines for access to technology.

Grievances and Solving Problems – According to University Policies, available from the Division of Student Affairs, if you have a problem with this class, “You should seek to resolve a grievance concerning a grade or academic practice by speaking first with the instructor or professor.” Then, if necessary, with the department chairperson, college dean, and provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23, which is available from the Office of Student Life, 208 Ohio Union.” “Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant’s department.“

Statement on Diversity – The College of Education and Human Ecology affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Technology - Required for Teacher Licensure and/or NCATE – Students will be introduced to science related educational technology resources as part of this class. Students will be expected to include educational technology in their lesson designs where appropriate.

Weekly Agenda
<table>
<thead>
<tr>
<th>Week # (L#)</th>
<th>Date</th>
<th>Assignments &amp; Due Date</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Weekly Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 22</td>
<td></td>
<td></td>
<td>Introduction – Syllabus; Course expectations; Unit planning</td>
<td>Introduction to Engineering Design Introduction to unit planning</td>
</tr>
<tr>
<td>2</td>
<td>Aug 28, 29</td>
<td>Zwiers, Chapter 1&amp;2</td>
<td>The E in STEM; Engineering in 7-12 science learning &amp; teaching; The Common Core Science Framework</td>
<td>Science #1: Physics lesson 1; Understanding how students use language; language for academic thinking</td>
<td>Major themes in physics instruction; learning progressions for themes; naïve understandings</td>
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<tr>
<td></td>
<td></td>
<td>Physics reading 1</td>
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<td>Reading Reflection #1.</td>
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<td></td>
<td>Read: Zwiers, Chapter 3</td>
<td>Science #1: Physics lesson 2; Inquiry in physics</td>
<td>Science #1: Physics Lesson 3</td>
<td>Learning by inquiry; physics demonstrations ; feedback loops in T&amp;L; engineering &amp; physics</td>
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<tr>
<td></td>
<td>Sep 4, 5</td>
<td>Physics reading 2&amp;3</td>
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<td>Reading Reflection #2</td>
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<td>Read: Zwiers, Chapter 4</td>
<td>Science #1: Physics Lesson 4</td>
<td>Science #1: Physics lesson 5 Inqury and academic language</td>
<td>Effective demonstrations; lesson planning, physics’ examine student work; assessment in physics</td>
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<td>Sep 11,12</td>
<td>Physics reading 4&amp;5</td>
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<td>Reading reflection #3</td>
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<td>Read : Zwiers Chapter 5</td>
<td>Science #1: Physics 6 - demonstrations</td>
<td>Science #2: Chemistry lesson 1</td>
<td>Major themes in chemistry instruction; learning progressions; naïve understandings; engineering</td>
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<td>Sep 18, 19</td>
<td>Physics reading 6</td>
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<td>chemistry reading 1</td>
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<td>RR4:</td>
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<td>Read: Zwiers, Chapter 6</td>
<td>Science #2: Chemistry lesson 2</td>
<td>Science # 2: Chemistry lesson 3; Planning a unit ; Table of specifications; Item analysis</td>
<td>Macro, submicroscopic, formula representations; models in chemistry instruction</td>
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<td>Sep 25, 26</td>
<td>Chemistry readings 2 &amp; 3</td>
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<td>RR 6</td>
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<td>Mid Term Project Due</td>
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<td>Oct 2,3</td>
<td>Read Zwiwers, Chapter 7</td>
<td>Science #2: Chemistry lesson 4</td>
<td>Science #2: Chemistry lesson 5</td>
<td>Naïve conceptions; particulate nature of matter; graphing in science; assessment in chemistry</td>
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<td>Chemistry readings 4 &amp; 5</td>
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<td>RR 8</td>
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<td>Oct 9,10</td>
<td>Read Zwiers, Chapter 8</td>
<td>Science #2: Chemistry lesson 6</td>
<td>Science #3: Life Science Lesson 1</td>
<td>Multiple representations; intro to life science; engineering; examine student work</td>
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<td>Chemistry reading 6</td>
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<td>life science reading 1</td>
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<td>Oct 16,17</td>
<td>Read Zwiers, Chapter 9</td>
<td>Science #3: Life Science Lesson 2</td>
<td>Science #3: Life Science Lesson 3</td>
<td>Major themes in life science; naïve conceptions; use of models</td>
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<td>Life science readings 2 &amp; 3</td>
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<td>Oct 23,24</td>
<td>Life science readings 4 &amp; 5</td>
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<td>Science #3: Life Science Lesson 4</td>
<td>Multiple representations in life science instruction; lab reports; assessment in life science</td>
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<td>Oct 30,31</td>
<td>Life science reading 6</td>
<td>Science #3: Life Science Lesson 6</td>
<td>Science #4: Earth &amp; Space L1</td>
<td>Unit planning in life science; intro to earth &amp; space; engineering; examine student work</td>
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<td>earth and space reading #1</td>
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<td>RR 10</td>
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<td>Nov 5,6</td>
<td>Earth &amp; Space science</td>
<td>Science #4: Earth &amp; Space L2</td>
<td>Science #4: Earth &amp; Space L3</td>
<td>Scale and perspective in E&amp;S science;</td>
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<td>readings #2 &amp; 3</td>
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<td>RR 11</td>
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<td>Nov 12,13</td>
<td>Earth &amp; Space science</td>
<td>Science #4: Earth &amp; Space L4</td>
<td>Science #4: Earth &amp; Space L5</td>
<td>Field trips; inquiry lesson design in ES education; engineering;</td>
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<td>readings 4 &amp; 5</td>
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<td>RR12</td>
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<td>Week # (L#)</td>
<td>Date</td>
<td>Assignments &amp; Due Date</td>
<td>Tuesday</td>
<td>Wednesday</td>
<td>Weekly Theme</td>
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<td>Nov 19</td>
<td>Earth &amp; Space science reading 6 RR13</td>
<td>Science #4: Earth &amp; Space L6</td>
<td>NO CLASS</td>
<td>Models in E&amp;S science; examine student work; assessment in E&amp;S science</td>
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<td>Nov 27, 28</td>
<td>Work on unit plan; prepare final presentations</td>
<td>Unit Planning</td>
<td>Unit planning</td>
<td>Academic integrity; cheating; honor codes; plagiarism</td>
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<td>15</td>
<td>Dec 4</td>
<td>Science Unit Due</td>
<td>Final presentations &amp; review for final</td>
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**Final exam**