C&I 451 Teaching Elementary Science II  
Fall 2006

Instructor: Margery Osborne, 386 Education, m-osbor@uiuc.edu, 351-8975

Course Objectives: Explore/investigate current theory and practices in teaching elementary science; connect course instruction to elementary and middle school classroom participation experiences.

Web Resources

- Benchmarks for Science Literacy: [http://www.project2061.org/publications/bsl/online/bolintro.htm](http://www.project2061.org/publications/bsl/online/bolintro.htm)
- State Standards [http://www.isbe.state.il.us/ils/science/standards.htm](http://www.isbe.state.il.us/ils/science/standards.htm)

Overview

Building on the basics of science education covered in CI350, this course will cover comprehensive planning for inquiry-based science teaching.

Grading/Assignments

Class attendance and active participation in classes are expected. Excused absences must be confirmed with the instructor via e-mail or in person, preferably in advance. Unexcused absences will lower your grade.

1. Journal (Portfolio) (30 points)
2. Science unit (40 points)
3. Web-Based Inquiry (30 points)

Journals: There is an assignment (or assignments) for each week described in the schedule. Some will be done in class; some will be homework. All need to be posted on our moodle by the day before our next class meets.

Teaching at Booker T Washington Elementary: You will be going to BTW Elementary School in Champaign as part of your class C&I 475 with Bonnie Armbruster. She and I are teaming on this assignment and for both of your visits there you will be teaching a reading and writing activity in science. The dates for this are tentatively Sept 25 and Oct 30.

Web-Based Inquiry: You will select your own topic for the Web-Based Inquiry and develop this assignment on our moodle. The Office of Educational Technology will provide any technical assistance that you may require. Due last class.

Curriculum study: This will be a description of the science curriculum being used in one of your participation classrooms/schools/school districts. To find out about the curriculum, you will need to (1) look at whatever written materials are available to the teacher (text, lesson plans, etc), (2) interview your cooperating teacher about the curriculum and get her opinion of it, (3) possibly interview someone in the school district administration about the curriculum; and (4) if possible, teach a lesson from the curriculum or observe your cooperating teacher teaching from the curriculum. Due first week of November.

8/24Class 1: National and State Science Education Standards: Review

curriculum study assignment; recommend that students work on this early, due first week of November.

**Homework due 8/31:** After reading the following two papers, write a 3-4 paragraph essay on aspects of the current approach to science instruction with which you feel comfortable or uncomfortable at this point in time. Address the issues raised in the papers.


**8/31 Class 2: Current Thinking and Trends in Science and Science Education: From Philosophy to Standards to High-Stakes Testing**

*In-Class Activities:* Lecture/discussion re readings and assignment, look at the national and state standards.

- [http://www.isbe.state.il.us/ils/science/standards.htm](http://www.isbe.state.il.us/ils/science/standards.htm)
- [http://www.nap.edu/readingroom/books/nses/](http://www.nap.edu/readingroom/books/nses/)
- [http://www.project2061.org/publications/bsl/online/bolintro.htm](http://www.project2061.org/publications/bsl/online/bolintro.htm)

Go to library and review curriculum materials.

**Homework due 9/7:** Pick a curriculum series and particular grade level textbook. Report on how this text addresses national and state standards. Does it help you prepare children for high stakes testing such as the ISAT?

**9/7 Class 3: How Do Children Construct Understanding in Science?**

*In-class Activities:* Discuss results of homework assignment. Watch Annenberg/CPB video(s) from *Minds of Our Own* series.

**Homework due 9/21:** Read the following articles related to several models for inquiry-based science instruction. Select one of the models and describe how you could/will use this model for science instruction.

Lorsbach, Anthony. The Learning Cycle as a Tool for Planning Science Instruction [http://www.coe.ilstu.edu/scienceed/lorsbach/257lrcy.htm](http://www.coe.ilstu.edu/scienceed/lorsbach/257lrcy.htm)


**9/14 Class 4: Developing an In-Depth Understanding of Inquiry**

*In-Class Activities:* Review Chapter 2 information. Watch video(s) of teachers using inquiry-based science instruction (provide video guide—things to watch for re homework assignment)

**Homework due 9/28 or 10/5:** After reading the following, write critique of a video teacher:

9/21Class 5: Inquiry Continued

In-Class Activity: Other curriculum materials—tubs, kits (GEMS, AIMS, etc.). Do activities from one of the above sources. Develop a classroom management plan for this unit as a group.

Homework: Plan your lesson for BTW Elementary School. Include a rubric for assessment.


In-Class Activities: Discuss your experiences at BTW School.

Critique a web-based inquiry (read and use only the “WBI Qualification Criteria Chart” in the Instrument Manual; http://www.lehigh.edu/~amb4/wbi/wbi-v1_0.pdf
Webquest Website: www.webquest.org (look at science)
Berkeley WISE projects: http://wise.berkeley.edu/
Lehigh EnviroSci Inquiry http://www.leo.lehigh.edu/envirosci/
Science Netlinks http://www.scienccnetlinks.com/
Classroom of the Future: http://www.cet.edu/products/products.html

and use these to begin to think about WBI topics.

Homework : Email me your tentative WBI topic at m-osbor@uiuc.edu. Read the following articles related to several models for inquiry-based science instruction. Select one of the three models and describe how you could/will use this model for science instruction.

Lorsbach, Anthony. The Learning Cycle as a Tool for Planning Science Instruction http://www.coe.ilstu.edu/scienceed/lorsbach/257lrcy.htm


Handout: Project-Based Approach

10/5Class 7: Review of Science Instructional Strategies

Science activities as exemplars of various instructional strategies

Homework: After completing the readings for next week, develop a field trip-based lesson on the same topic you plan to develop for your WBI. Also, describe how you will provide differentiated instruction within the context of your WBI—either for varying academic levels in general or for a specific type of student (ESL, gifted, etc.)

Science Field Trips Handout, Discovery Boxes Handout, Differentiated Instruction Handout
http://filebox.vt.edu/users/sahouck/portfolio/learning_centres.html


10/12Class 8: Field trip—Anita Purves Nature Center

In-class Activity: Visit Anita Purves Nature Center

Homework: Develop a plan for how you would extend and integrate a field trip activity such as the ones offered by Anita Purves.

10/19Class 9: Models for Inquiry-Based Science Curricula and Lessons: 3E or 5E Approach, Problem-Based Learning, Project–Based Learning

In-class Activity: Discussion of models: similarities and differences, best-use situations, practice using models

Homework: Find and critique a website that involves students in a visualization activity, an interactive simulation, watching an on-line video, or the use of a distributed information source. Look at the examples listed below first, so that you have a basis for comparison. Your emphasis should be on finding something that could be used for your WBI.

Scientific visualizations: 3D Insects:  
www.ento.vt.edu/~sharov/3d/3dinsect.html
Interactive Internet Applications (science):  
http://www.pbs.org/wgbh/nova/hotscience/
Light and Color Tutorials (on-line interactive simulations):  
http://olympusmicro.com/primer/lightandcolor/java.html (Parent Site:  
(Simulations, Cool Visuals, Virtual Microscopes): Molecular Expressions  
(http://micro.magnet.fsu.edu/index.html)
Simulations and Models: Gizmos http://www.explorelearning.com/
Animated video clips: BrainPOP: www.brainpop.com
Video: Unitedstreaming www.unitedstreaming.com
Distributed information sources: Center for Improved Engineering and Science Education Collaborative Projects  
http://www.k12science.org/currichome.html

10/26Class 10: Using Learning Technologies in Science Education

In-class Activities: Lecture/discussion on technology, look at sites found for homework

Homework: Make the final choice for the topic and approximate grade level that you might be interested in using for the WBI. Record your rationale for selecting the topic. Find and list the state standards (science content, grade-level benchmarks) related to this topic and the science assessment framework items  
(http://iirc.niu.edu/scripts/students_know.asp) that match the topic. Find the NSES content standards (Chapter 6, grade-level benchmarks) that relate to this topic and
list them. You can copy and paste state and national standards and assessment framework items!

11/2 Class 11: Individual Conferences

Discuss curriculum study and progress on WBI

Homework: Plan your lesson for BTW Elementary School. Include a rubric for assessment.

11/9 Class 12: Individual Conferences

In-class Activities: Discuss your experiences at BTW School. Discuss curriculum study and progress on WBI

Homework: Go to the Rubistar Web site (http://rubistar.4teachers.org/index.php) and develop and print out a grading rubric that might be used for an assessment in your WBI.
Read: Classroom Assessment and the National Science Education Standards Chapter 3 http://books.nap.edu/html/classroom_assessment/ch3.html

11/16 Class 13: (11/17) Assessing Students in Science, Resources, Integration, Management


Discuss “standardized” vs. classroom assessment, formative/summative assessment, connecting assessment to objectives; review grading rubrics.

Homework: WBI outline

11/30 Class 14: Science Fair

In-class Activities: Share WBI units.

Homework: Science in my participating classroom: critique

12/7 Class 15: Curriculum Studies and Classroom Experiences, Course Evaluation

In-Class Activities: Discuss and compare local school science curricula and experiences during the semester with science instruction in participating classroom, course evaluation
CI 451 Teaching Elementary Science II
Curriculum Study Assignment

For this assignment, you will write a description of the science curriculum being used in one of your participation classrooms/schools/school districts. To find out about the curriculum, you will need to (1) look at whatever written materials are available to the teacher (text, lesson plans, etc), (2) interview your cooperating teacher about the curriculum and get her opinion of it, (3) possibly interview someone in the school district administration about the curriculum; and (4) if possible, teach a lesson from the curriculum or observe your cooperating teacher teaching from the curriculum.

Your curriculum study should include the following information (grading criteria):

- When the curriculum was selected or developed and by whom
- What written materials are available for the use of the teacher: commercial texts, supplementary materials for the texts, units, lesson plans, etc.
- What additional resources are made available for the use of the teacher: materials, videos, field trip expenses, etc.
- How the science curriculum is actually used by your cooperating teacher: as is, modified, ignored, etc.
- If your teacher does something other than using the district/school science curriculum, what does he/she do?
- Your cooperating teacher’s perspectives on the school/district science curriculum
- Your critique of the curriculum: skim the written materials, look at the overall objectives, etc; use the lesson taught by the teacher or by you as a specific example.
  - What topics are covered at the grade level you are observing?
  - How well does the curriculum match the state and national standards for both content and methods (inquiry)?
  - How practical is the curriculum; are the hands-on activities reasonable in terms of materials, format, etc.?
  - Are the reading materials and activities engaging and age-appropriate?
  - How would you feel about using this science curriculum?

Scoring Rubric

Excellent: Papers that are thoughtful, well-organized and address all of these topics will be given full credit (30 points).

Good: One topic omitted, other topics covered well. (27 points)

Acceptable: Two topics omitted or topics covered only superficially (24 points)

Unacceptable: Several topics omitted. Paper must be rewritten.

For poor organization or poor readability (please proofread!), 5 points will be subtracted from the scores listed above.
Web-Based Inquiry Assignment

This assignment involves setting up a website, and the instructional staff in the Office of Educational Technology will help with this.

There are two parts to the assignment: a web site for student use and a supporting teacher’s guide. The teacher’s guide can be text-only; the student web site should include graphics. For the student web site, we will use a format similar to that developed by Olivet University. To look at example of their WBIs (e-units), go to http://t2n.olivet.edu/qa.htm and go to the bottom of the page. There are links to 4 different WBIs at 4 different grade levels. Our format will differ slightly (below).

Student Web Site Format:
- Problem Statement or Driving (Focus) Question: Can be very simple for younger children; more complex for older students. The activities are planned so that students find information to use to facilitate their ability to answer the question or resolve the problem.
- Learning Challenge: Detailed information on the goals of the inquiry
- Action Plan: A planning worksheet for students to print out
- Team Activities: Some required for all teams, some optional (each team must do a specific number of optional activities); can be on-line or off-line activities; best to include both. Include at least 2 required team activities and at least 4 optional activities from which students may select 2 activities.
- Individual Activities: same as above, but for each student to do individually
- Presenting Team Findings (Assessment): Description of summative assessment activity (or choice of activities); grading rubric

Teachers Guide
Introduction and Overview

1. Standards: List the Illinois Science standards addressed (preferably using grade level benchmarks) and the appropriate items from the Illinois Science Assessment Framework, and remember to include both process (Goal 11) and content (Goals 12 and 13)
2. Objectives for the unit (these should be more specific than the standards; you may want to think in terms of objectives for each activity and then make a list of these)
3. Teacher Background Information: any basic general information that the teacher should know about the WBI, perhaps some references to content for the teacher
4. Assessment: Describe the formative and summative assessment for the WBI; include rubrics and test instruments, if used
5. Advanced Preparation for the Unit (all materials needed and any other prep)

Activity Support Information
List the team and individual activities; provide any additional information that might be needed by the teacher but is not included in the activity description for the students. You don’t need a “lesson plan” for each activity.
# Web-Based Inquiry Assignment: Grading Rubric

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Excellent</th>
<th>Good</th>
<th>Acceptable</th>
<th>Re-write</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount of Information</strong></td>
<td>All components included as described in the assignment, and all adequately addressed. A teacher considering this WBI for use could read the introduction and overview section and gain a good understanding of what the unit is about. There is adequate information for both students and teachers to support successful completion of the activities.</td>
<td>All components included but one or more inadequately addressed.</td>
<td>Missing one component and/or several are inadequately addressed.</td>
<td>Missing several components.</td>
</tr>
<tr>
<td><strong>Quality of Information</strong></td>
<td>Activities are clearly appropriate for the topic and grade level. Science information is accurate. Developmental level is appropriate; activities allow for some differentiation re academic ability and learning style.</td>
<td>Topic and activities are appropriate; one or two activities could be improved.</td>
<td>One or more activities clearly developmentally inappropriate and/or do not fit topic.</td>
<td>Several or all topics and/or activities are inappropriate.</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>WBI is well organized and is easy to navigate (materials could easily be used by someone other than authors). Links are functional and appropriate.</td>
<td>Information is organized, but a few small improvements could be made.</td>
<td>Information is organized, but difficult to follow in some places.</td>
<td>The information appears to be disorganized.</td>
</tr>
<tr>
<td><strong>Mechanics</strong></td>
<td>No grammatical, spelling or punctuation errors.</td>
<td>Almost no grammatical, spelling or punctuation errors.</td>
<td>A few grammatical, spelling, or punctuation errors.</td>
<td>Many grammatical, spelling, or punctuation errors.</td>
</tr>
<tr>
<td><strong>Consistency and Coordination</strong></td>
<td>Good match between standards, objectives, activities, and assessment. The activities facilitate learning the stated objectives and the assessments assess student understanding of the objectives.</td>
<td>A few minor mismatches between the components.</td>
<td>A few major mismatches between the components.</td>
<td>Little or no thoughtful alignment of standards, objectives, activities, and assessment</td>
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Teacher Inquiry Project: A Collaboration between CI475 & CI451

Purpose: The purpose of this project is to give you experience in using a teacher inquiry process while teaching actual reading/writing in science lessons to students in primary and intermediate level classrooms in a local school.

Relationship to Illinois Standards:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Standard Number</th>
</tr>
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<tbody>
<tr>
<td>Elementary Education Content Area Standards</td>
<td>2, 8, 9, 10, 11, 12, 13, 14, 16</td>
</tr>
<tr>
<td>Illinois Professional Teaching Standards</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 10</td>
</tr>
<tr>
<td>Core Language Arts Standards for All Teachers</td>
<td>1, 2, 3</td>
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Directions: As part of a small group, you will be responsible for planning, teaching, and reflecting on reading/language arts lessons in the content area of science in a local school—Booker T. Washington Elementary School in Champaign. On each of two days during the semester, you will be responsible for instruction in two classrooms for the entire morning (during regularly scheduled class hours). You will be given one class day in CI 475 prior to the assigned teaching days to prepare for the lessons (9/18 and 10/23). You will be given one class day in CI 451 following the instruction (9/28 and 11/2) for discussion and reflection on what took place in your classrooms. Both Dr. Osborne and I will be present for those classes.

Required components of this assignment for each lesson you teach (a total of four lessons):
1) Complete lesson plans, using the standard lesson plan format. Although this is a group project, there should be a designated teaching role for each member of the group, which should be reflected in the Procedures.
2) Copies of student work as evidence of learning from the lesson.
3) Completed copy of “Looking at Student Work” form (to be distributed later).
4) Personal reflection on the instruction. What did you learn about teaching science? about teaching reading and writing in a content area? What was most valuable? What will you repeat or avoid in the future?
5) A self-evaluation of your performance in this group project, and an evaluation of other members of the group.

You will need to make two copies of each component of this assignment—one to submit to CI 475 and one to submit to CI 451.

Due Dates: Oct. 2 (for the two lessons on Sept. 25) and Nov. 6 (for the two lessons on October 30). Dr. Osborne will have her own due dates for this project.
Looking at Student Work

1. Number all student work samples for ease of reference. Review all student work samples.
2. Identify what skills, strategies, or content prior knowledge students need to accomplish the task you gave them. (e.g., science concepts, vocabulary, mechanics, grammar, sentence structure, etc.).
3. Using a T chart (see reverse side for example), list student strengths on the left side.
4. On the right side, list possible next teaching steps. What students would you instruct together in a small group? (You will probably have 3-6 groups in all.) What would your teaching focus for each group be?
5. Select one group of students. Identify an instructional strategy or activity that you would use with this group if you were to meet with them again tomorrow. Discuss why you chose this particular strategy or activity.
6. Tell how you will assess the students in this group.