I. COURSE DESCRIPTIONS

**IUN Bulletin description:** Focus on curriculum decisions teachers make every day. Specifically, students in this course will examine current learning theories and apply those theories to instructional practices at the middle grades and high school. **Prerequisites:** For M446: M437/M301 and 85% of required science courses; for S508: admission to either UTEP’s Option II or IU Northwest’s Transition to Teaching Program and S508 with Middle/Jr. high school science field experience.

This course is the second of two science methods courses designed for students who plan to teach science in the middle/junior high and high school. These two courses emphasize the importance of active- and inquiry-based learning. Students will have ample opportunities for using these models as they teach secondary children as part of the accompanying field experience program. Field experiences for this second course will be at the high school level.

**Course Goals**

Students taking M446 / S508 will:

- become creative, effective, reflective, and caring high school science teachers.
- realize that teaching science can be fun and rewarding.

II. SCHOOL OF EDUCATION MODEL

These courses are based upon a research-based conceptual framework that incorporates outcomes, all of which together are designed to prepare a “Reflective Professional.” This chart shows the outcomes of this model and which course objectives that apply to each. The asterisks indicate the outcomes for which portfolio artifacts will be made.

<table>
<thead>
<tr>
<th>Reflective Professional Model</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication Skills</td>
<td>2, 7, 8, 12</td>
</tr>
<tr>
<td>2. Higher Order Thinking Skills *</td>
<td>8</td>
</tr>
<tr>
<td>3. Instructional Media / Technology</td>
<td>1, 2, 3, 8</td>
</tr>
<tr>
<td>4. Learning and Development</td>
<td>7, 8, 9</td>
</tr>
<tr>
<td>5. School Culture and Context</td>
<td>6, 7, 9</td>
</tr>
<tr>
<td>6. Instructional Design and Delivery *</td>
<td>1, 2, 4, 5, 7, 8, 12</td>
</tr>
<tr>
<td>7. Classroom Management</td>
<td>8</td>
</tr>
<tr>
<td>8. Assessment and Evaluation</td>
<td>8</td>
</tr>
<tr>
<td>9. Professional Development</td>
<td>10</td>
</tr>
</tbody>
</table>
## Initial Program Dispositions

The SOE is committed to the values of academic integrity in teacher preparation. Students are expected to consign themselves to each of the following dispositions throughout this semester in classroom participation, projects, and assessment activities:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attendance, punctuality &amp; professionalism</td>
<td>7. Student-centered management of class time &amp; student behavior</td>
</tr>
<tr>
<td></td>
<td>(i.e., actions, appearance)</td>
</tr>
<tr>
<td>2. Connect subject to students’ world</td>
<td>8. Respects students from diverse backgrounds</td>
</tr>
<tr>
<td>3. Align teaching with state &amp; professional standards</td>
<td>9. Promote cooperation in class, school, community</td>
</tr>
<tr>
<td>4. Prepare and promote active learning</td>
<td>10. Track student progress &amp; adjust teaching to meet needs</td>
</tr>
<tr>
<td>5. Communicate ideas clearly in speech and writing</td>
<td>11. Willing to receive constructive criticism and suggestions</td>
</tr>
<tr>
<td>6. Use of multiple approaches &amp; technology to teach</td>
<td>12. Committed to becoming an effective teacher</td>
</tr>
</tbody>
</table>

## COURSE OBJECTIVES

Students enrolled in this high school science methods course will:

1. Show an awareness of a variety of resources available for high school science teachers including national and state science periodicals, computer software, and the Internet.
2. Use electronic technology to communicate with others and to prepare teaching materials. Develop teaching lessons in which teachers would use electronic technology to facilitate learning.
3. Evaluate and demonstrate computer software designed for the high school science classroom.
4. Demonstrate a discrepant event and the teaching of a science skill appropriate for high school.
5. Plan a field trip to a local facility such as a park or museum paying special attention to needs of students with disabilities.
6. Conduct a service learning activity in a non-traditional science teaching activity.
7. Plan and conduct action research.
8. Write lesson plans appropriate for high school science classes that include:
   - objectives which require analysis, synthesis, and evaluation.
   - strategies which address students' various learning styles.
   - a variety of methods of teaching and evaluation including an effective use of questioning skills
   - an effective use of technology, and integration of science with other subjects
   - a strategy for dealing with probable student misconceptions.
   - a correlation with Indiana’s Academic Standards.
9. Make adjustments in plans, as needed, to account for exceptionalities.
10. Join a professional organization of teachers of science. Attend at least one professional development event.
11. Reflect upon the teaching of science in urban areas. (S508 students only)

## III. MATERIALS

- **Indiana’s Academic Standards: Science**, Indiana Department of Education, 2000
- **Indiana Professional Standards Board: Standards for Teachers of Science**
  - Available on the web at [http://www.state.in.us/psb/standards/teacherindex.html](http://www.state.in.us/psb/standards/teacherindex.html)
- **Invitations to Science Inquiry**, Tik L. Liem, NSTA, 1987. (Optional)
IV. COURSE REQUIREMENTS

Course Expectations

Attendance and participation are very important in this class. Students are expected to attend and participate in all class activities and discussions. Students who cannot attend a class, for whatever reason, should call 980-7766 before class begins and arrange for an alternative assignment. Students who will be late, should also call.

Formal written materials must be typed on a word processor. Word processing features such as enlarged type size [for the title page], bold face [for headings] and justification should be used as appropriate. Papers should be double-spaced with a 1-inch margin. Font size should be about the size used here. (This is “Times 11.”) Do not use cute or hard-to-read fonts. Papers must have a professional appearance and be grammatically, historically, mathematically, and scientifically correct. Citations must be properly listed.

Assignments are due at the beginning of class periods. Due dates may be altered on account of illness or if arranged in advance. If a student is unable to attend class when an assignment is due, the student must ensure that the assignment is quickly submitted (via another student or US mail), within 24 hrs. A written assignment submitted late will have points deducted (usually 5% / school day – 25% / week). Students who have an unexcused absence on the day of a demonstration may not reschedule the demonstration.

Redoing assignments: Assignments may be redone if the grade received is a B- or lower and a "Redo Packet" is submitted within one week of the original work being returned. The packet must contain: Both the original and the revised copies, the original assessment form, and a cover sheet which describes all changes made. Altered materials should be highlighted on the revised copy. (On long assignments, only revised pages need be reprinted). Sections of any assignment not done the first time cannot be redone.

• If submitted early: A written assignment may be submitted two weeks early, then redone. If resubmitted on time, only the second evaluation will be recorded.
• If submitted on time: A written assignment submitted on time may be redone. The final grade will be an average of the two evaluations, except that no such grade shall be higher than 85%.

Assignments

1. List of free materials/Grant opportunities: (6 or more items—at least 2 from each category) available from the Educator’s Guide to Free Science Materials (at the IUN library: Q181.A1 E3) or online. Describe each item, give the address and explain how one can obtain the materials/grant. Give a copy to your mentor or cooperating teacher.

2. Join ILF.

3. Download a science lesson plan that involves a hands-on activity on your unit, make hard copies for all and bring them to class. Compare with others for completeness, level of higher order thinking skills used, level of lab, instructional model used, etc.

4. Web-site demonstrations: Demonstrate 3 useful web sites that could be used for high school science teaching on your unit.

5. Lab upgrade. Choose one lab activity from the science textbook from your high school field assignment that pertains to your unit. Rewrite it so that it meets the characteristics of a higher-order lab. The lab must be “doable,” that is it must be practical and appropriate for high school science students. Turn in a photocopies of the original lab (with full citations of where it came from), your revised lab, and identify the “level” of both. Include a coversheet that explains the difference between the two labs and describe what you did to change the “level.”

6. High School Science Curriculum Report. Part 1: On one sheet of paper describe the science program at the high school where you will be doing field work this semester. Answer questions such as

• What science courses are offered at your school?
• How many sections (classes) of each course are there this semester? How many will probably be offered in the spring semester?
• what resources (e.g. internet) or text books are used in the courses you will teach?

Part 2: On one sheet of paper describe the year-long curriculum for the primary course for which you will be doing your high school field experience. Answer questions such as:
• what units (subjects) are taught in the fall / in the spring?
• what are the seating and lab arrangements? Is a separate room for either lab or computer use available?
• does your cooperating teacher have use of a homework hot line or a faculty/course web page that students or parents can access? Does the teacher ever/frequently communicate with students via email, texting, etc.?

7. **Classroom/Laboratory Safety Report.** Discuss safety concerns with your field teacher. Report on:
   - general safety rules for the classroom and science laboratory
   - specific times when special student precautions are necessary
   - specific times when special teacher precautions are necessary
   - interesting stories related to safety

Prepare a 2-3-page paper and as well as a short PowerPoint slide show to present the report to the class. In the paper compare your classroom policies to what we have been taught in class. Email the PowerPoint before class so that it can be installed on the classroom computer.

8. **Controversial issue research paper.** Each student is to find a current controversial science-related issue suitable for your unit, which will serve as the topic for this assignment. This 8-12 page paper (not including title page, references, etc.) should address the following:
   - What is the issue? Why should it be examined?
   - What are the opposing viewpoints? Who are the people making the opposing claims? What evidence does each side use to justify its position?
   - What are the ramifications for the high school science classroom?
   - What have local reactions been to the issue?
   - How do you believe this is best addressed in the classroom?

Students must write from a neutral position. It is important for this paper to not make unproved generalizations (e.g. “humans are causing global warming.”) but to word such statements in a form such as “Many scientists now believe that humans are causing global warming (Sonnberg, 2009).”

Refer to the section on formal written materials earlier in this syllabus.

Photocopy (or make hard copies) and turn in all source materials and highlight sections that are referred to in this paper. This paper must have at least 4 sources published within the last 2 years. Two of those sources must be from the print media and two from reliable Internet sites. Citations in the text must be given anytime others’ viewpoints or contributions are given. Use the style of references that is contained in Section VI of this syllabus. Every citation in the text must have an entry in the references. Give the date (if available) of the writing of all Internet sources as well as the date it was downloaded.

**Turn in two copies:** One following all the guidelines here and on pages 2-3. The other, a file copy, may be single spaced, small font (at least 8 pt) and double-sided to save paper.

Use PowerPoint to present a summary of this report to the class.

9. **Demonstrate 2 Mind Captures** suitable for high school science on your unit plan topic.

10. **Concept map:** on your chosen unit plan topic and appropriate for high school with about 18-22 concepts. Note the Indiana high school standard/s related to your topic.

11. **Micro-Teaching:** Teach 20-30 minutes of two of the lessons in your unit two the class. One of the lessons should be part of a hand’s on laboratory and the other should involved guided inquiry.

12. **Pre-instruction assessment project/Action Research Report:** Before any teaching is done on concepts in your unit plan, interview 15-20 field students about two or more concepts included in your lesson plans. First, create a list of possible concepts (scientific principles) and misconceptions that you believe students will know or have before they experience the lesson. Then interview the students, using open-ended questions to see if they understand the concepts or have any of the projected misconceptions. Report on what you learned about student misconceptions.

   In your report
   - Name the topic and grade level for which this project was done.
   - List the concepts and misconceptions that you were looking for.
     (e.g. Concept: The earth is a planet; Misconception: The sun revolves around the earth.)
• List the questions that you asked
• Note the responses you got from the students. Be specific about each question.
• Note which misconceptions are common, which are unusual.
• Reflect on each of the questions asked. (e.g. Would you ask them differently if you were to do this again?)
• Note how you were affected by the interviews.

Make 2 copies and give the second copy to your supervising teacher.

13. **An inquiry-based unit plan** appropriate for secondary school science. (Requirements are at the end of the syllabus.) Turn in 2 copies, one following the requirements listed elsewhere and a file copy marked “copy.” Also turn in the Unit Plan and Artifact 6(1) Score Sheets.

14. **Student Learning Report.** Create assessment instruments (e.g. pretest and quiz) for two of the lessons taught in the field that measure whether students met each of your objectives. This must include a means to measure students’ skills or knowledge before you taught the lesson and afterwards. You must write a summary of your effect on student learning. The report must include for each of the two lessons: the Indiana Academic Standards upon which the lesson was based, the lesson plan, the pre- and post-instruction instruments, data which document student learning, and a summary.

15. **Long-term science activity** (same topic as for last semester but appropriate for high school grades): Design and carry out a long-term science activity suitable for your unit such as to:
   • retrieve earthquake information from the Internet and plot on a world map
   • plant seeds under certain conditions and record what happens each week
   • retrieve daily precipitation and barometric information and graph

   The activity should extend for 8 - 10 weeks. Discuss the plan for activity with the instructor before beginning. Document the activity (photos are great if appropriate) and describe the results through a PowerPoint presentation.

16. **Professional development activity or Service Learning activity and documentation.** Do either of the following: Attend a professional development activity designed for teachers. Or: After discussing this activity with your instructor, volunteer your services to assist with some sort of science instruction or educational activity at a Science Olympiad event, FIRST Lego League Tournament, a local nature center, a County, State, or National Park, or other extra-curricular appropriate place. Submit a thank you letter or certificate documenting participation.

17. **Science teacher organizations:** **Proof of membership** for two organizations (state, national, or subject-area) or two reviews of articles from *The Science Teacher* or other approved science teacher journals.

18. **Advising receipt.** Sign up for advising, participate in an advising session, procure an advising receipt, complete the advising evaluation and turn it in to the office, and show the receipt to me.

19. **Critiques:** Critique two of your peers mind captures and two of your peers microteaching assignments. Each critique will have at least 3 points in the “Kudos’ section” and 3 points in the “Suggestions section”.

20. **Field Trip:** Plan a field trip suitable for a high school science class as part of your unit. Be sure to include where you will be going, the objectives, the costs, transportation, chaperone requirements, a permission slip, and assessment method.

**PORTFOLIO ARTIFACTS**

In addition to being graded, the unit plan will be scored as portfolio artifacts for Artifact 6(1): Instructional Design and Delivery: Unit Plan
Rubrics and score sheets can be found at [http://www.iun.edu/~edu/programs/rubrics_ug.shtml](http://www.iun.edu/~edu/programs/rubrics_ug.shtml)

**M446 - Methods of Teaching Secondary School Science**
**S508  Methods of Teaching Science II**

**Fall 2010**
FIELD EXPERIENCE REQUIREMENTS (M301 / M500 / M501)

FE-1. **High School Science Curriculum Report.** (See requirements above.)

FE-2. **Classroom/Laboratory Safety Report.** (See requirements above.)

FE-3. **Observe and reflect on at least 10 different science lessons taught by at least 3 different teachers.** S508 and M550 students who are full-time teachers should talk to Mrs. Wozniewski about ways to meet this assignment. Reflections must be emailed ASAP after the observation or teaching experience. They must include the date and time, description of class, and how that lesson might be done differently to be more effective next time. Attach a lesson plan to all reflections that include your teaching. Three questions that can help guide these reflections are:

- What happened?
- So what?
- Now what?

FE-4. **Demonstrate a mind capture** to a high school science class.

FE-5. **Plan and teach 3 science lessons. Videotape one of them.**
   - One lesson shall be expository following a direct instruction model (lecture, discussion, direct instruction, etc.)
   - One lesson shall be based on the learning cycle. (On your plan be sure to indicate its steps.)
     (See example in the appendix.)
   - The third lesson may be any type of guided discovery (lab) instruction.

   Students should prepare plans early enough, so that after discussing them with the cooperating teacher, they can be revised as necessary. Lesson plans must include measurable instructional objectives and teaching plans including sample questions that you plan to ask the children.

FE-6. **Create an assessment instrument** (e.g. quiz / checksheet) for each of the above lessons which measures whether students met each of your objectives. Use the instruments if your cooperating teacher approves.

FE-7. **Student Learning Report:** See requirements in the section above.

FE-8. **Pre-instruction assessment project.** (See requirements above.)
V. ASSESSMENT AND GRADING
Assignments and points possible for each

- Free materials/Grant Opportunities 5
- Download / discuss lesson plan √
- Web-site demonstration 5 each
- Lab upgrade 15
- High School curriculum report 10
- Safety Report 15
- Controversial issue research paper 50
- Mind Capture demonstrations 10 each
- Concept Map 10
- Join ILF √
- Pre-instruction assessment 30
- Inquiry-based unit plan 100
- Student Learning Report 25
- Long term science activity 20
- Service learning or Prof Dev √
- Proof of membership or article reviews 10 each
- Advising receipt √
- Micro-teaching 20 each
- Critiques 5 each
- Field Trip 15
- Field assignments √
- Field Reflections 10 each
- Field taught lessons 10 each
- Field assessment instrument 10
Note: Grades will be lowered for unexcused absences (generally 1 letter grade per absence after the first); no student with an unexcused absence will receive an A. Students who do not complete all assignments, but who have a C or better on the other assignments, may receive an Incomplete. Lack of participation (including excessive tardies or lack of attendance, even if excused) will result in grades being lowered. Superior ratings (A+) will be given only to assignments which need no improvement and are produced independently with little input from the instructor. Letter grades will be determined using the above and by the following scale:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-92%</td>
<td>A-</td>
</tr>
<tr>
<td>80-82%</td>
<td>B-</td>
</tr>
<tr>
<td>70-72%</td>
<td>C-</td>
</tr>
<tr>
<td>60-62%</td>
<td>D-</td>
</tr>
<tr>
<td>93-97%</td>
<td>A</td>
</tr>
<tr>
<td>83-87%</td>
<td>B</td>
</tr>
<tr>
<td>73-77%</td>
<td>C</td>
</tr>
<tr>
<td>63-67%</td>
<td>D</td>
</tr>
<tr>
<td>98-100%</td>
<td>A+</td>
</tr>
<tr>
<td>88-89%</td>
<td>B+</td>
</tr>
<tr>
<td>78-79%</td>
<td>C+</td>
</tr>
<tr>
<td>68-69%</td>
<td>D+</td>
</tr>
</tbody>
</table>

Corrections: One point extra credit will be given to the first student who reports, via email, grammatical or spelling errors contained in this syllabus or on any "official" papers distributed in class.

VI. BIBLIOGRAPHY


Indiana Department of Education. (2000). *Indiana’s Academic Standards*


VII. Principles of the Interstate New Teacher Assessment and Support Consortium

The following chart shows the ten principles of the Interstate New Teacher Assessment and Support Consortium (INTASC) and the course objectives that apply to each.

<table>
<thead>
<tr>
<th>INTASC Principles</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives</td>
<td></td>
</tr>
<tr>
<td>1. Knowledge of Subject Matter</td>
<td>4, 7, 8</td>
</tr>
<tr>
<td>2. Knowledge of Human Development and Learning</td>
<td>7, 8</td>
</tr>
</tbody>
</table>
3. Adapting Instruction for Individual Needs  7, 8, 9  
4. Multiple Instructional Strategies  2, 3, 4, 5, 8  
5. Classroom Motivation and Management Skills  8  
6. Communication Skills  1, 2, 8  
7. Instructional Planning Skills  7, 8  
8. Assessment of Student Learning  8  
9. Professional Commitment and Responsibility  1, 10, 11  
10. School and Community Partnerships  5, 6

### VIII. IPSB Developmental Standards

This chart shows how course objectives relate to the Developmental Standards established by the Division of Professional Standards. Standards below that are followed by an asterisk are particularly emphasized by this course.

<table>
<thead>
<tr>
<th>Teachers of Early Adolescence</th>
<th>Teachers of Adolescence &amp; Young Adulthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Young Adolescent Development</td>
<td>1. Development of Adolescents &amp; Young Adults</td>
</tr>
<tr>
<td>2. Healthy Development</td>
<td>2. Decision Making                     7, 8, 9</td>
</tr>
<tr>
<td>3. Middle School Philosophy &amp; Organizations</td>
<td>3. The High School Learning Community* 1, 2, 5</td>
</tr>
<tr>
<td>4. Middle School Curriculum* 1, 8</td>
<td>4. Curriculum* 1, 8</td>
</tr>
<tr>
<td>5. Middle School Instruction* 2, 3, 4, 5, 7, 8, 9</td>
<td>5. Instructional Strategies* 2, 3, 4, 5, 7, 8, 9</td>
</tr>
<tr>
<td>6. Family involvement</td>
<td>6. The Home-School Connection</td>
</tr>
<tr>
<td>7. Community involvement</td>
<td>7. Community &amp; Transition to the Future* 6, 8, 11</td>
</tr>
<tr>
<td>8. Teacher roles* 1, 2, 4, 5, 7, 8, 9, 10</td>
<td></td>
</tr>
<tr>
<td>9. Collaborative behavior 6</td>
<td></td>
</tr>
</tbody>
</table>

* denotes particularly emphasized standards.
## IX. TENTATIVE SCHEDULE (2010)

<table>
<thead>
<tr>
<th>Wk</th>
<th>Date</th>
<th>Topic</th>
<th>Assignments due</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>1</strong> Types of Instruction <strong>ILF</strong></td>
<td><strong>Assignments due</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preview of spring semester</td>
<td><strong>Sign-up for Topic for Unit</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Types of Lesson Plans</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Wk 2</strong></td>
<td><strong>8</strong> Lessons requiring Higher Order Thinking Skills <strong>Contemporary issues in science education Planning high school science lessons</strong></td>
<td><strong>Goals for unit</strong></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Safety considerations in high school science <strong>Outline for unit</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finding resources about controversial issues <strong>(First week of field for TrT)</strong></td>
<td></td>
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<tr>
<td></td>
<td>4</td>
<td><strong>22</strong> The goals and objectives of science teaching <strong>Long-term science activities</strong></td>
<td><strong>Free materials/Grants list</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The new Indiana and National Science Standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td><strong>29</strong> Levels of being “hands-on” <strong>Concept development / concept map review</strong></td>
<td>**Down-loaded lesson plan <strong>(First week of field)</strong></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td><strong>Oct. 6</strong> Mind Capture demonstrations 1 <strong>Controversial issues in the science classrooms-resources</strong></td>
<td><strong>Mind Capture 1</strong></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td><strong>13</strong> Critique Mind Capture <strong>Designing a high school science unit</strong></td>
<td><strong>Critique Mind Capture Controversial Issues Report</strong></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td><strong>20</strong> Controversial issues presentations</td>
<td><strong>High School Curriculum Report</strong></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td><strong>27</strong> Mind Capture demonstrations 2 <strong>Classroom management</strong> <strong>Assessment issues</strong></td>
<td><strong>Mind Capture 2</strong></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td><strong>Nov. 3</strong> Review of strategies for teaching and assessing Mind Capture critiques</td>
<td><strong>Concept map Critique Mind Capture Pre-instruction Assessment</strong></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td><strong>10</strong> Micro-Teaching 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td><strong>17</strong> Individual appointments to go over unit plans</td>
<td>Field Assessment Instrument Lab upgrade</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td><strong>24</strong> Problems in methodology <strong>Micro-Teaching Critiques</strong></td>
<td>Safety report Micro-Teaching Critiques</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td><strong>Dec. 1</strong> Micro-Teaching 2</td>
<td></td>
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<tr>
<td></td>
<td>15</td>
<td><strong>8</strong> Long-term Activities /Teaching video presentations <strong>Micro-Teaching Critiques</strong></td>
<td><strong>Long-term Activity / classroom video Student Learning Report</strong></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td><strong>15</strong> Web-site demonstrations / Course evaluations</td>
<td><strong>Web-site demonstrations</strong></td>
</tr>
</tbody>
</table>
Advising Receipt
Professional Develop./Service Learn.

Membership/Article Reviews

Document.
Creating an Integrated Science Unit Plan

Choose a science (not health) topic which may incorporate another discipline (such as mathematics, language arts, or social studies) and which may be one which you plan to teach this semester or when doing student teaching. Be sure that the subject chosen allows you to meet all the requirements listed below. Create a three- or four-week unit plan for the teaching of that subject. (The number of days in the unit plan may not be a multiple of 5)

The Plan should consist of six parts:
1) The unit overview
2) The lessons
3) Annotated lesson plans
4) Supplementary materials
5) Assessment
6) Resource List

1. Unit Overview

Title page with grade level or, for secondary plans, course name indicated.

Unit Goals. (written in general terms; see page 1 of the syllabus for an example.)

Bulletin board ideas or other classroom displays.

Concept map incorporating all the main concepts from the unit (Include this even if it’s already been assessed.)

Likely misconceptions that students might have. Explain how you know that they are "likely." (In other words synthesize the results from your action research report.) For each of the misconceptions, note where (in which lesson) it will be addressed.

Indiana Science Academic Standards: Include all those that apply to your unit and grade level. For example: “3.1 The Universe: Students should know that: The patterns of stars in the sky stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.” Look through all the sections to find appropriate standards.

Indiana Academic Standards of another discipline: Include all those that apply to your unit and grade level.

2. The Lessons

Unit Schedule: Assume that science will be taught every day. The schedule must have lessons presented in a logical sequence. Each lesson must have objectives and a short description (Some objectives may be used more than once, as necessary.) Each lesson should address visual, auditory, and kinesthetic learners and be of an appropriate length. A lesson may extend for more than one day (If so it needs just one set of objectives). The lesson descriptions may be short, but they must specifically address what will be done to prepare children to meet the objectives or to overcome the misconceptions (from the unit overview). Do not count review days or exam days as "lessons."

Lessons should not be based on a text-book although a textbook may be used as a classroom resource. Students are not to take turns reading from the text in class, but text readings may be given as homework.

Lesson Objectives: For each lesson, write an average of 2 cognitive objectives. For the unit also write at least 5 affective or psychomotor objectives. All objectives should reflect unit goals. Identify each objective by type and level. (e.g. Cognitive: Synthesis) Be sure to write them in behavioral terms (so that they can be measured) unless you believe that another form is better (and then specify why). Be very careful not to list classroom activities as objectives. Objectives are what students should know, or be able
to do, *as a result of* your lesson, not what they will do during the lesson. (Psychomotor objectives are usually part of guided discovery lessons. Affective objectives are attitudes or values that students will learn as a result of your lesson. Your text must show how you will prepare your students to meet all objectives (cognitive, affective and psychomotor) and all objectives must be assessed.
Lesson types:

• **Guided discovery activities.** A 3-week unit should have at least 3, but preferably 6 or more guided discovery activities including at least one learning cycle activity. **Note:** Art or craft activities are not guided discovery. Type in a description of the activity or (if possible) refer to a photocopy of the activity. (Any extra materials can always be placed in an appendix.)

  Each of the following should be incorporated into at least one lesson:

- **Direct instruction** following a teaching model such as Borich’s or Hunter’s. (For this lesson, identify whose model and list what you will do for each of the steps)

- **Children’s literature.** (Elementary only.) Literature here is defined as a story with characters that the children can relate to. Include a photo-copy of the title page and one typical page of text and complete an Analysis form from this Guide.

- **Tech/Prep or STS.** (Secondary units only.) Tech/Prep lessons are very applications-based; students should know why certain material is to be learned and who, in business or industry needs to know it. STS (Science/Technology/ Society) refers to the interrelationship of these three areas. For this lesson (may be more than one), be sure to note specifically how the relationship is made.

- **A multicultural or international scope** to reflect other’s contributions or viewpoints.

- **At least 3 lessons which integrate the instruction of another discipline** (e.g. social studies in the science lesson). (This is in addition to the multicultural and literature-based or TechPrep / STS lessons described above.) State standards for the other disciplines must be referred to.

- **Electronic media** (computers, laser discs, videos) Include the name, publisher, and time required for any video or software. If the Internet is used, give the Internet address of each source to be used.

Include 2 of the following 5 attributes: (More than 2 will earn extra credit.)

- **3 extra guided discovery activities** (referred to above)

- **a field trip or a guest speaker** (For field trip, give the name and address of location + time spent. For guest speaker give name of speaker, topic of "speech" and amount of time he/she is to take.)

- **a mind capture demonstration** (Describe the activity)

  Any or all lessons may incorporate more than one of the above criteria. However please **be sure that you indicate which criteria are included in each lesson.** All resources must be given complete citations.

3. **Annotated Lesson Plans**

Write annotated lesson plans for the days that the learning cycle and the direct instruction lessons are given. These two plans are to be far more detailed than the lesson plans that you would write as a teacher. They **must** include many suggestions for specific open-ended questions throughout the lessons as well as plans for presenting the material and assessing student progress. Good lessons often begin with, end with, and incorporate many forms of questions.

**The preparation and introduction:**

- **Objectives** (Copied from the schedule above.)

- **Set up** (what needs to be done beforehand) and **Materials needed:** (how much) --including AV materials.
Science process skills taught  (Such as measuring, inferring, etc.)

Introduced vocabulary and/or concepts:  (Then bold-face the words as they appear in the lesson.) Be sure to appropriately introduce the new words within the lesson.

The lesson:
•Learning cycle lesson / Direct instruction lesson (+ time allotted):  How are you going to teach it? Label and describe each step of the model you chose.
•Questions:  Use lots of questions / List the questions you will ask the students.

Modifications of the plan for students with exceptionalities:  Be specific here.  What is the exceptionality, what modification is necessary, why do you believe that this modification is helpful.

Homework assignment, if given and formative assessment for the lesson.

Attach supporting materials if used.  (Worksheets, transparencies, assessment)  Materials must include several levels of cognitive objectives.

4. Supplementary materials
The transparency and worksheet below may be placed with the annotated lesson plans or in this section.

Sign or banner:  A self-made, computer generated sign or banner related to the topic of the unit.  (Could be a safety poster if lab activities require safety guidelines.)

Overhead transparency or PowerPoint presentation:
At least one self-designed overhead transparency.  (A sufficiently large font must be used for all text (16 pt is OK.)  Include your name at the bottom in small type, such as you see on the Educational Objectives sheets in the Guide.  Enclose the “master” that you used to create it.

or
One PowerPoint presentation.  This must include good graphics to illustrate the important points of the lesson.  Include both a printout of the presentation and a disc.

Worksheet:  At least one self-designed worksheet which contains computer “clip-art” (or other type of illustration if more appropriate) and several levels of cognitive objectives.  (see elsewhere in this Guide)  For primary grades use a large font.  Include your name at the bottom of the worksheet in small type.

Certificate of Achievement to be given to (deserving) students at the end of the unit.  (Elementary units only):  Self-designed, with your name printed as the teacher on the certificate.  Use Print Shop or other similar program.  Relate it to your topic and make it interesting!  (Don't use the boring example in your syllabus!)

5. Assessment  (All materials must be self-made.)

Assessment Plan:  Design an assessment plan with both formative and summative components.  The plan must include more than just quizzes and/or exams and it must show how a student’s final grade will be determined.  (i.e. what percentage of the unit grade comes from each item, including homework.)

•The assessment instruments must assess whether students met each of the stated cognitive objectives.
•Assessment must include some tasks.  (in addition to cognitive tasks)

Rubric:  Include at least 1 performance or science skill assignment and rubric.

Quizzes and the Unit Exam
•Each exam or quiz must include several levels of cognitive objectives (See the Bloom handout)
•There must be a summative assessment instrument.  (Usually a unit exam.)
(A guideline for the number of questions on an elementary-level unit exam might be $5 \times \text{grade level} + 5$. However, the number may be much lower if several higher-order thinking questions are asked.)

- Multiple choice questions may be used for part of an exam, but only if there is a good mixture of upper-level questions (such as application and analysis, etc.)
- No true-false or matching instruments may be used.
- Provide a key for all tests.

**Objective / Assessment Match.** Create a chart showing each of your objectives and how it is assessed.

**Alternative assessment** may be used if discussed and approved *in advance* by the instructor.

6. **Resource List**

List all materials that you used for this plan: Textbooks, workbooks, videos, Children's lit, software, etc.

**General Notes**

All materials in the unit plan should be appropriate to the content and intended grade level. You may assume that your school owns equipment and supplies normally found in public schools. Do not confine yourself to the room where you are conducting field experiences now.

**Format:** The unit plan must have a professional appearance and it should be bound. A 1/2" or 1" loose-leaf notebook is preferred because it can be easily altered in later years. Please, no thicker than 1". The preferred format is Times-12 font, single spacing--skipping lines between sections, and bold-facing headings. You may, of course, use professionally-made worksheets or transparencies in addition to those you create.

The plan should not:

- Include extraneous materials. (More is not necessarily better.)
- Use hard-to-read, cute, overly large or small fonts, or be printed with poor quality ink.
- Be typed in all capital letters, except for occasional emphasis.
- Have pages enclosed in plastic sheets.
- Include posters, books, films or videos--but citations for these should be included if they are needed.
- Turn in 2 copies, one following these requirements and a file copy (very small, single-spaced text only). And as always, all must be grammatically, historically, mathematically, and scientifically correct.
HIGHER ORDER THINKING SKILLS

2

E325, E547, M330, M437, M441, M457, M452, S508

4 = Excellent (clear, convincing, and consistent evidence)
3 = Quite Satisfactory (clear and convincing evidence)
2 = Needs Revision (limited evidence)
1 = Unacceptable (little or no evidence)

<table>
<thead>
<tr>
<th>Score</th>
<th>1. Identify and analyze K-12 students’ levels of thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Use instructional strategies that require students to engage in analysis, synthesis, and/or evaluation</td>
</tr>
<tr>
<td></td>
<td>3. Specifies how the activity requires students to solve or address problems</td>
</tr>
<tr>
<td></td>
<td>4. Include and identify materials that require a range of higher order thinking skills</td>
</tr>
</tbody>
</table>

Artifacts must also pass IU Northwest Writing Competency standards. See Web: [http://www.iun.edu/~writenw/competencies.shtml](http://www.iun.edu/~writenw/competencies.shtml)

ARTIFACT: ___________________________________________  SCORE: _____

Reviewer’s Signature: ___________________________  DATE: _______

Science Methods Artifact

1. Take two or more student essays and “identify and analyze the students’ levels of thinking.” The essays can be from exams that you or someone else has given—if so, remove all references to the students’ identity. They may also be downloaded from the Web.
2/3. **Design or modify a lesson plan that** uses “instructional strategies that require students to engage in analysis, synthesis, and/or evaluation.”

*Note specifically how this* “activity requires students to solve or address problems.”

4. **Create a list of 10 science class activities that** “require a range of higher order thinking skills.”

Note: To receive a 4 for any portfolio artifact requires clear, convincing, and consistent evidence.
### INSTRUCTIONAL DESIGN: INTEGRATED UNIT PLAN

6 (1)
E328, E343, E516, E541, M446, M459, M469, M483, M430, S508

<table>
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<th>Description</th>
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<tr>
<td>4</td>
<td>Excellent (clear, convincing, and consistent evidence)</td>
</tr>
<tr>
<td>3</td>
<td>Quite Satisfactory (clear and convincing evidence)</td>
</tr>
<tr>
<td>2</td>
<td>Needs Revision (limited evidence)</td>
</tr>
<tr>
<td>1</td>
<td>Unacceptable (little or no evidence)</td>
</tr>
</tbody>
</table>

1. Displays knowledge of content and accurately identifies major concepts to be taught
2. Designs units that include strategies for the incorporation of teaching multiple disciplines in meaningful ways
3. Designs units that include a variety of instructional strategies (e.g., direct instruction, inquiry, Socratic lessons, group instruction) for promoting higher order thinking and is clearly identified in the lessons
4. Designs units that include teaching materials (e.g., physical models, various technologies)
5. Clearly delineates sequences of lessons and/or includes an appropriate teaching schedule
6. Includes guided or independent practice
7. Includes an assessment plan
8. Overall plan of instruction is sensitive to cultural and learning differences
9. Teacher/student “friendly”
10. Uses a standard academic format, appropriate spelling, grammar, punctuation and referenced citations

Artifacts must also pass IU Northwest Writing Competency standards.
See Web: [http://www.iun.edu/~writtenw/competencies.shtml](http://www.iun.edu/~writtenw/competencies.shtml)

**ARTIFACT:** ________________________________  **SCORE:** ______

**Reviewer’s Signature:** __________________________  **DATE:** _____
INSTRUCTIONAL DELIVERY
6 (2)
M301, M304, M500, M501

4 = Excellent (clear, convincing, and consistent evidence)
3 = Quite Satisfactory (clear and convincing evidence)
2 = Needs Revision (limited evidence)
1 = Unacceptable (little or no evidence)

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is organized and prepared</td>
</tr>
<tr>
<td>2. Uses technology appropriately</td>
</tr>
<tr>
<td>3. Communicates clearly and positively</td>
</tr>
<tr>
<td>4. Demonstrates knowledge of content</td>
</tr>
<tr>
<td>5. Engages learners in the subject matter and uses active learning methodologies</td>
</tr>
<tr>
<td>6. Employs effective questioning techniques and higher-level inquiry</td>
</tr>
<tr>
<td>7. Adjusts instruction to accommodate differing learning needs and styles</td>
</tr>
<tr>
<td>8. Projects a professional image (appearance, voice, demeanor)</td>
</tr>
<tr>
<td>9. Demonstrates meaningful reflection by critically analyzing the planning and teaching of the lesson</td>
</tr>
</tbody>
</table>

Artifacts must also pass IU Northwest Writing Competency standards. See Web: http://www.iun.edu/~ writenw/competencies.shtml

ARTIFACT: ____________________________ SCORE: _____

Reviewer's Signature: ____________________________ DATE: _____
Deleted from the 2009 syllabus

Constructing science through “inquiry” / Chapter 4

/Ten Myths of Science

Deleted in 2008 (grad students only this semester)

14. Graduate-student essay:
   • Urban experience essay. (S508-UTEP only) Write a five-page essay in which you reflect upon the teaching of high school science in urban areas. Reflections of other teachers at your field-experience site must be included as part of the essay.
   • Transition to Teaching essay. (S508-TtT only) Write a five-page essay in which you reflect upon learning to teach science through the TtT program. Comments about the program made by your cooperating field teacher must be included as part of the essay. (This essay is to be about the TtT “program.” Students should be forthright in their stated opinions. The purpose here is to assure graduate credit for the students and at the same time to improve the program.

M446 - Methods of Teaching Secondary School Science

May want to add

Web assignments for each week: See M437 2001
Field trip for a high school class
School context report for where they will be doing student teaching
DPS Standards review—last week or so