COURSE SYLLABUS **Fall 2010**

TLT 426 : Science in Elementary Education

Course homepage: http://coursesite.lehigh.edu

Thursday 4:10 - 7:00 PM 490 STEPS

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Office hours:
Wednesdays 3-4:30 pm

Format:
This is a Web-enhanced 3 credit graduate course. This course is composed of *synchronous* and *asynchronous* activities. Synchronous activities occur live and "face-to-face," while asynchronous activities may take place at different times for different learners. Face-to-face synchronous sessions will be primarily activity and discussion based. Asynchronous activities will include readings, handouts, reviewing online materials, and working on course-related activities.

Because some of the content for this course is delivered asynchronously, we are freer in our synchronous sessions to cover application and synthesis of the concepts covered. This means we may meet slightly less often than in a "traditional" course. While not having as many formal class meetings gives you the freedom to accommodate your schedule more easily, it is up to you to keep up with the asynchronous activities so that you gain the most you can from our synchronous sessions.

Description

The philosophy behind this course is that anyone, teacher and students alike, learns best by "doing science". The same applies to the teaching of science. You will become a better teacher of elementary school science by improving teaching techniques such as lesson planning, trying out new methods of teaching, integrating instructional technologies into your instruction, reflecting on teaching, and becoming aware of research on how children learn and the latest teaching methods.

The major goals of this course focus on preparing you to teach science in grades K-6. Accordingly, the goals are that (1) you will learn effective strategies for teaching science to all elementary students including special education students and English language learners (ELL), (2) you will accumulate a collection of teaching materials and know where to find additional resources, and (3) that you will find that science is vibrant, exciting, and essential for all members of society. You will also become familiar with using PDE's Standards Aligned System (SAS) to ensure 21st century teaching and learning skills. SAS links together the six common threads that lead to great schools: clear standards, fair assessments, curriculum framework, instruction, materials and resources, and interventions.

Objectives *(By the conclusion of the course, students will demonstrate ability to…)*

- develop an elementary science unit plan linked to the Pennsylvania Department of Education academic standards for science and technology or for environment and ecology.

- prepare K-6 science lessons plans appropriate for *all* learners including special education students and English language learners (ELL).
- understand process-oriented inquiry methodology and apply it to a K-6 classroom science lesson.
- be able to locate and use science teaching materials appropriate for *all* learners including special education students and ELL
- integrate instructional technology into the K-6 science classroom that are appropriate for *all* learners including special education students and English ELL.
- use assessment techniques in the K-6 school classroom that are appropriate for all learners including special education students and English language learners (ELL) in a standards-aligned system.

Required Course Lab Materials Fee

This course requires a $9 lab materials fee. Please make checks out to Lehigh University.

PDE Competencies and Standards

This course also addresses specific competencies required by the Pennsylvania Department of Education and aligns with PDE standards. A detailed listing of those competencies and standards are attached to the end of this document, or you can go to http://www.lehigh.edu/education/pde/courses.html

Required Textbooks

Carin, A., Bass, J., & Contant, T. (2009). Activities for Teaching Science as Inquiry. 7th Edition. Upper Sadle River: New Jersey: Pearson. ISBN: 978-0-13-615680-2

Martin, David Jerner. (2009). Elementary Science Methods: A Constructivist Approach. 5th Edition. Belmont, CA: Wadsworth Cengage Learning. ISBN: 978-0-495-50675-1

Project WILD K-12 Curriculum and Activity Guide

Optional Textbooks

National Research Council (1996). The National Science Education Standards. Washington, DC: National Academy Press. ISBN Number: 0-309-05326-9
(The contents of this book are available online: **http://books.nap.edu/html/nses/html/**).

National Research Council (2000). Inquiry and the National Science Education Standards: A Guide for Teaching and Learning. National Academy Press. ISBN Number: 0-309-06476-7
(The contents of this book are available online:
http://books.nap.edu/html/inquiry_addendum/)

Course Web site and E-mail:

A Web site for this course exists and contains class information, course handouts, links to online readings, and other resources. The URL is:

http://coursesite.lehigh.edu/

Each student is assigned an e-mail address at registration. Students are expected to use e-mail as one form of communication with the instructor during this semester.

Web-based Resources:

A variety of Web-based instructional resources are used both in and out of class. Access to these resources are available on the following Websites:
Science Education at Lehigh University: http://www.lehigh.edu/~amb4
Website Science at Lehigh University: http://www.lehigh.edu/~amb4/websci/
Science Education Courses at Lehigh University: http://www.lehigh.edu/~amb4/courses
Web-based Inquiry for Learning Science: http://www.lehigh.edu/~amb4/wbi

Course Readings [Course Website and online]

Armon, J., and Linda J. Morris. (2008, April/May). Integrated Assessments for ELL. Science and Children, 49-53.

Atkin, J.M. (2002). Using assessment to help students learn. In R.W. Bybee, ed., *Learning Science and the Science of Learning*, pp. 97-103. Alexandria, VA: NSTA Press.

Banks, S. R. (2005). Classroom assessment. Issues and practices. Boston, MA: Pearson. pp. 122-139.

Bodzin, A. (2008). Science inquiry projects on the Web. In R. Bell, J. Guess-Newsome, & J. Luft (Eds.) *Technology in the secondary science classroom*. pp. 63-74. Arlington, VA: NSTA Press.

Bodzin, A., and Cates, W. (2002). Inquiry *dot* Com. Web-based activities promote scientific inquiry learning. *The Science Teacher 69* (9), 48-52.

Brown, P.L., and Abell, S.K. (2007, Summer). Cultural diversity in the science classroom. Science and Children, 60-61

Bybee, R. (1997). *Achieving Scientific Literacy*. Portsmouth, NH: Heinemann. p.167-186.

Century, J.R., Flynn, J., Makang, D.S., et. al, (2002). Supporting the science-literacy connection. In R.W. Bybee, ed., *Learning Science and the Science of Learning*, pp. 37-49. Alexandria, VA: NSTA Press.

Coburn, A. (2000, March). An inquiry primer. Science Scope, 42-44.

Corder, G. (2007, September) Supporting English language learners' reading in the science classroom. Science Scope, 38-41.

Cox-Peterson, A.M., & Olson, J.K. (2002). Assessing student learning. In R.W. Bybee, ed., *Learning Science and the Science of Learning*, pp. 105-118. Alexandria, VA: NSTA Press.

Enger, S. K. and Yager, R. E. (2001). *Assessing Student Understanding*. Thousand Oaks, CA: Corwin Press. p. 14-33, 128-135.

Ford, B., and Taylor, M. (2006, September). Investigating students' ideas about plate tectonics. Science Scope, 38-43.

Grumbine, R., and Alden, P. (2006, March). Teaching science to students with learning disabilities. The Science Teacher, 26-31.

Hansen, L. (2006, January). Strategies for ELL sucesss. Science and Children, 34 - 38.

Jeffries, C. (1999). Activity Selection: It's More Than The Fun Factor. *Science and Children, 37* (2), 26-29, 63.

Jones, I. (1999). A Workshop Approach. *Science and Children, 37* (3), 27-30, 55.

Krajcik, J., Czerniak, C, & Berger, C. (2002). How can learning technologies be used to support investigations? In Teaching Science in Elementary and Middle School Classroom. Boston, MA: McGraw Hill. p. 167-197.

Matkins, J.J., and McDonnough, J. (2004, February). Circus of Light. Science and Children, 50-54.

Miller, K. W., Steiner, S. F. and Larson, C. D. (1996). Strategies for Science Learning. *Science and Children, 33* (6), 24-27.

The National Science Education Standards. National Research Council of the National Academy of Sciences. Washington, DC: National Academy Press, 1996. ISBN Number: 0-309-05326-9. Online available: http://books.nap.edu/html/nses/
Overview, Chapters 1, 3, 6 (Content Standards K-4 and 5-8) or (p. 115 – 171).

Olson, J. K. (2003, September). Students' interest in the nature of science. Science Scope, 18-22.

Olson, J., Levis, J.M., Vann, R., & Bruna, K.R. (2009, January). Methods and strategies: Enhancing science for ELLs.

Ormsbee, C.K., & Finson, K.D. (2000) Modifying science activities and materials to enhance instruction for students with learning and behavioral problems. *Intervention in School and Clinic, 36*(1), 10-21.

Padilla, M. J. & Pyle, E. J. (1996). Observing and Inferring Promotes Science Learning. *Science and Children, 33*(8), 22-25.

Pennsylvania Department of Education. (2009). *Academic Standards for Science and Technology and Engineering Education.*

Pennsylvania Department of Education. (2009). *Academic Standards for Environment and Ecology.*

Peters, E. (2008, January). Assessing Scientific Inquiry. Science Scope, 27-33.

Pray, L., & Monhardt, R. (2009, March). Sheltered instruction techniques for ELLs. Science and Children, 22 - 25.

Rowe, M.B. (1996). Silence, Silence, and Sanctions. *Science and Children, 34* (1), 35-37.

Spargo, P. E. and Enderstein, L. G. (1997). What Questions Do They Ask? *Science and Children, 34* (6), 43-45.

Shepardson, D. P. and Britsch (1997). Children's Science Journals: Tools for Teaching, Learning, and Assessing. *Science and Children, 34* (5), 12-17, 46-47.

Sterling, H. A. (1999). Teaching with Dewey on My Shoulder. *Science and Children, 37* (3), 22-25.

Straits , W. (2007, October). A literature-circles approach to understanding science as a human endeavor. *Science Scope*, 32-36.

Treagust, D. F. et al., (2003, March). Embed assessment in your teaching. Science Scope, 36-39.

Wittrock, C. A., and Barrow, L. H. (2000, February). Blow-by-blow inquiry. Science and Children, 34-38.

Graded Assignments

Below is a list of assignments that will be graded, along with the percentage of the final grade total for each. The assignments are explained in detail in the "Assignments" section.

Assignment	Percentage	Due Date
Guided Inquiry Lesson Plan	10%	10/14
Classroom Observation and Interview Report	15%	10/21
Science Instructional Unit Planning Outline	5%	10/28
Web-facilitated Science Activity	10%	11/18
Science Instructional Unit	35%	12/02
Final Exam	25%	12/15-12/17

IMPORTANT COURSE REQUIREMENT: A copy of your
1. Guided Inquiry Lesson Plan
2. Web-facilitated Science Activity
3. Science Instructional Unit
must be placed in your TLT EPortfolio. Your final course grade will not be released until the course instructor has viewed these three artifacts in your EPortfolio.

Assignments submitted that have also been submitted for another Lehigh course will not be accepted.

An assignment submitted for one assignment may not count as part of the requirement for another course assignment.

Regular attendance and **timely submission** of assignments are expected of graduate students and are not, therefore, rewarded in the assignment of marks. All assignments are due at the **start** of class on the date indicated on the syllabus.

Overdue assignments will be marked down 1/2 of a letter grade for each day submitted late. For example, an assignment submitted 1 day late would receive a maximum of an A-/B+ grade. An assignment submitted 2 days late would receive a maximum of a B grade.

Criteria Employed In Assigning Marks

MARK	WHAT IT REFLECTS
A	Excellent work that demonstrates a clear understanding of the material under study and a superior ability to utilize that material in the assignment submitted. When options for marks are involved, indicates successful completion of the highest level option.
B	A solid piece of work that demonstrates an understanding of the material under study and utilizes that material well in the assignment submitted. Usually either fails to include some pertinent material or utilizes that material less well than would warrant assignment of a mark of A. When options for marks are involved, indicates successful completion of more than the minimal level option.
C	Adequate work that demonstrates a basic understanding of most of the material under study and which utilizes that material to some extent in the assignment submitted. Usually contains errors or omissions involving relevant material. When options for grades are involved, indicates successful completion of minimal level option.
D	Work that fails to demonstrate understanding of the material under study and fails to utilize relevant material in the assignment submitted. When options for marks are involved, indicates failure to complete successfully the minimal level option.
F	Work that is incomplete, inappropriate, completely incorrect, or was submitted late. This mark indicates severe problems that lead to questions about whether the student should be involved in graduate study.

Combined marks (like A-/B+) are used in interim calculations, but are not awarded on final marks, since the university does not utilize them. Minuses attached to marks suggest a slightly lower level of achievement. Pluses attached to marks indicate a slightly higher level of achievement.

In using letter marks to arrive at a final mark, the instructor converts them to grade points and averages them according to the following schedule (GPA=Grade Point Average):

Marks Assigned During Course	
Mark	**GPA**
A	4.00
A-	3.70
A-/B+	3.50
B+	3.30
B	3.00
B-	2.70
B-/C+	2.50
C+	2.30
C	2.00
C-	1.70
C-/D+	1.50
D+	1.30
D	1.00

Final Mark Determination	
Mark	**GPA**
A	3.80
A-	3.67
B+	3.30
B	3.00
B-	2.67
C+	2.30
C	2.00
C-	1.67
D+	1.30
D	1.00

D-	0.70
F	0.00

D-	0.67
F	0.00

The values on the right above are threshold values. That means the student GPA must **equal or exceed** that threshold value in order to receive the higher mark.

Absences

It is difficult to make up absences when a majority of class time will be spent examining, manipulating, and negotiating ideas. Also, class time will be used for the development of graded assignments. Please consider absences very carefully. The instructor reserves the right to lower the final one-half letter grade per absence for excessive absences.

Weather policy – Be advised that I will not cancel class unless the university does so. Canceled classes due to acts of God or war will be rescheduled.

Accommodations for Students with Disabilities: If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center C212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

WEEKLY SCHEDULE

Readings are posted to our course Web site (http://coursesite.lehigh.edu) and organized by class session number. Students are responsible for completing those materials each week BEFORE class.

Class	Class Meeting Discussion Topics	Before next class: ASYNCHRONOUS (Out-of-class). Always check Coursesite for additions. * denotes optional readings
#1 09/02	Course Overview. Introduction to science activity types and inquiry-based teaching and learning.	Read Chapter 1, 2 (Martin). Reserve readings: National Science Education Standards; Olson; *Bybee; * Ford & Taylor; *Sterling;
#2 09/09	Goals of science education. The National Science Education Standards. Nature of science.	Read Chapter 3 (Martin); Section 1 (Carin, Bass, Contant) Reserve readings: Padilla and Pyle; Spargo and Enderstein
09/10	*Last Day Drop/Add with a "W" and Registration*	
#3 09/16	Processes of science. Instructional models.	Read Chapters 4-5 (Martin); Reserve readings: Coburn; Jeffries; Jones; *Wittrock & Barrow; *National Research Council Inquiry and NSES Chapters 1-3, 7
#4 09/23	Constructivism in elementary science education. Inquiry. Activity Centers. Lesson planning.	Read Chapters 6-7 (Martin); Reserve readings: Brown & Abel; Corder; Grunbine; Hansen; Olson et .al; Ormsbee & Finson; Pray & Monhardt Pennsylvania Department of Education's Academic Standards for Science and Technology and Environment and Ecology. PA ELPs.
#5 09/30	Teaching science to diverse learners. Pennsylvania Department of Education's Academic Standards for Science and Technology and Environment and Ecology. PA ELPs. Lesson planning. Microteaching.	Read Chapter 8, 12 (Martin). Reserve readings: Atkins; Armon & Morris; Cox-Peterson & Olson; Peters; Shepardson and Britsch; * Banks; *Enger and Yager; *Treagust, et al.
#6 10/07	Assessment. Concept maps. Lesson planning. Microteaching	Read Chapter 10 (Martin). Reserve readings: Century et. al,; Rowe; Straits;*Miller et. al.
#7 10/14	Unit planning. Interdisciplinary approaches. Microteaching. *Guided Inquiry Lesson Plan due.*	Read Chapter 9 (Martin). Reserve readings: *Matkins & McDonnough
#8 10/21	Dr. Bodzin out of town at NE-ASTE meeting No face-to-face class meeting *Classroom Observation and Interview Report due.*	
#9 10/28	The elementary science classroom Microteaching *Science Instructional Unit Planning Outline due.*	Read Chapter 11 (Martin). Reserve readings: Bodzin; Bodzin & Cates

#10 11/04	Supporting science with Web-based resources. Web-based inquiry activities.	Work on Web-facilitated Science Activity facilitated inquiry.
#11 11/11	Project WILD.	Web- Reserve readings: Krajcik, Czerniak, & Berger Work on Science Instructional Unit.
#12 11/18	Technology integration. *Web-facilitated Science Activity due*.	Work on Science Instructional Unit. *Read Chapter 13,14 (Martin).
11/25	Thanksgiving Break. No class meeting	
#13 12/02	Project Leaning Tree. Exam Review. Course Evaluations. *Science Instructional Unit due.*	Prepare for Final Exam.
#14 12/09	Project WILD.	Prepare for Final Exam.
12/15- 12/17	Final Exam.	

Notes:	There may be additional readings and exercises in the course that are not listed above but which are assigned as the course develops. Absent students are responsible for learning of such assignments and for completing and submitting them on time. We will attempt to comply with this syllabus as much as possible, although our discussions and the ways in which we learn may necessitate changes. The instructor will give you as much advance notice as possible of any changes.

TBTE 426 Assignments

Guided Inquiry Lesson Plan/ Microteaching

You will prepare a process-oriented guided inquiry lesson plan for an elementary science classroom using the new Lehigh lesson plan format. Examples of lesson plans using a different format from past courses are located in the **Course Artifact Examples section of Coursesite**.

You will teach a 15-20 minute section of your lesson to the class. This microteaching should engage the class with hands-on manipulative materials. During the microteaching, **DO NOT** lecture, show more than a 2-minute video clip, or place students on computers.

Be sure to include student handouts, worksheets, and all assessment items with your submission. Include PowerPoint presentation or overhead slides as appropriate. Please note all media sources.

Provide copies of your lesson plan for your classmates prior to presenting your lesson by submitting your lesson to the Guided Inquiry Lesson Plan Forum on Coursesite.

Lesson Plan Format:

1. Target Grade or Age Level and Subject
2. Pennsylvania Content Standards: State the PA standard(s) including the PA ELPS (Language Proficiency Standards for English Language Learners PreK-12) to which your lesson aligns.
3. Learning Objectives: Specifically state the learning objectives for your lesson. Objectives should be written in the singular because acquisition of objectives is assessed at the individual student level. Begin each objective with "*The student will…"* and then include what will be learned, how it will be observed and measured, and what level of mastery is expected (e.g. Bloom's Taxonomy Verbs). Each objective should align to your assessment items. For example:

   The student will apply knowledge of a single electrical circuit as measured by creating a schematic diagram illustrating a workable circuit that includes a source, receiver, and wire. Students will be expected to complete this task with 100% accuracy.

   The student will distinguish among forms and sources of energy by analyzing the energy needs of PA, available energy resources, and infrastructure for production and distribution. The student will develop an energy policy statement that maximizes the use of sustainable energy and minimizes environmental impacts. The statement will be evaluated by the instructor using a rubric that measures quality of writing, policy content, and creative thinking. Students will be expected to receive a minimum score of 80 out of 100 on the rubric.

   NON-EXAMPLE: The student will write an energy policy statement that maximizes sustainable energy and minimizes environmental impacts. The statement will be evaluated by a rubric.

   The student will demonstrate knowledge of single digit addition to the sum of 5 by completing a 20-item math probe at a minimum of 90% accuracy.

   NON-EXAMPLE: Students will demonstrate addition by completing a 20-item math probe at a minimum of 90% accuracy.

The student will demonstrate knowledge of the three branches of government by responding with at least 80% accuracy on a multiple-choice quiz at the conclusion of the lesson.

NON-EXAMPLE: The student will be able to know the three branches of government as measured by a quiz.

The student will demonstrate the skill of blending by reading a three-word sentence that contains words with 1-3 letters (vowel/consonant or consonant/vowel/consonant) as measured by an oral reading quiz with 100% accuracy.

The student will demonstrate the self-care skill of tooth brushing by completing 10 steps of a systematic instruction plan with 100% accuracy.

5. Formative Assessments: An assessment is "formative" when the feedback from learning activities is actually used to adapt teaching to meet the learner's needs.

Describe the formative assessments you will use and how the data will be used to assess that leaning has occurred. Examples include journaling tasks, concept maps, anecdotal notes, questioning, observation, verbal practice, oral responding, draw and talk techniques, homework assignments, CBM and the like. Explain how you will use the data you gather to inform teaching and influence learning. Be specific. Your assessments should align to your lesson objective(s).

6. Summative Assessments: An assessment is "summative" when it measures student learning at a particular point in time and that is aligned with your stated learning objective(s)

Provide the assessment/assessment items that will measure whether learners have achieved the specific learning objective(s) for this lesson. Some examples include items (multiple choice, true/false, short answer and completion, essay items) that would be on quizzes or end-of-the unit assessments. This can also include criterion-based assessments. Include assessment items designed for English language learners.

7. Materials Needed: Provide a complete list of materials you will need to implement your lesson.

8. Expectations for Behavior, Safety, and Class Activities: This may include a review of class rules, safety procedures, or expectations and/or guidelines for participating in activities or completing assignments.

9. Description of Learning Activities: This section should clearly articulate what you and your students will be doing during the lesson. Supply detailed information so that the reader understands what will occur during your lesson implementation.

<u>Description of Introductory Activity (Anticipatory Set)</u>

Provide details on how you will introduce the lesson in the first 5-10 minutes to gain and focus student attention and link lesson to prior knowledge and experiences. This should contain details about your "warm-up activity." Activities may include: showing learners a discrepant event, posing related questions or brief learning tasks, leading learners in an introductory discussion, or conducting a demonstration. Also be sure to inform your learners of the objectives for the lesson. Describe how your introductory activity will include accommodations for any diverse learners (i.e. students with disabilities, struggling learners, English language learners with different stages of language acquisition, and advanced students).

<u>Modeling/Demonstration</u> (also elaborations/connections to content)

Provide an expert model that will show students how to learn the concept or perform the task. This should be highly teacher mediated/directed and might include explicit instruction. Describe how your modeling/demonstration will include accommodations for any diverse learners (i.e. students with disabilities, struggling learners, English language learners with different stages of language acquisition,

and advanced students).

Guided Practice and Feedback (also probing questions/student responses)

This links highly teacher mediated instruction to more student mediated learning. Provide multiple opportunities for learners to discuss, apply, practice, and think deeply about the new information. Explain how you will provide constructive, detailed feedback for both correct and incorrect performance. Make sure all feedback facilitates students' acquisition of the content covered. Describe how your guided practice will be modified to accommodate any diverse learners (i.e. students with disabilities, struggling learners, English language learners with different stages of language acquisition, and advanced students).

Independent Practice/Exploring

Provide an opportunity during the lesson for students to demonstrate independently their understanding of the concept or skill covered. This activity may be used to conduct your formative assessment.

Discussion Questions (and student responses): Questions you will ask students to stimulate their thinking toward the objective(s). What will you ask students during the lesson to ensure that they comprehend the main concepts of your lesson? What responses do expect from the children? Which student responses would indicate a lack of understanding or perhaps a misconception in the intended learning material. Describe how your guided practice will be modified to accommodate any diverse learners (i.e. students with disabilities, struggling learners, English language learners with different stages of language acquisition, and advanced students).

Review and Preview

How will you conclude your lesson to ensure that your learners understood the lesson's concept(s)? Lesson closure should take 2-5 minutes. What will you do to ensure they understood the "take home message" of your lesson? Describe how your review and preview will be modified to accommodate any diverse learners (i.e. students with disabilities, struggling learners, English language learners with different stages of language acquisition, and advanced students).

General Accommodations for Diverse Learners

Additionally, describe any general accommodations for diverse learners (e.g. extended time for assignments, guided notes, organizational tools, adaptive software and technologies, auditory amplification system, orally read instructions, books on tape, and the like). Learning objectives for diverse learners may include the conditions under which the student will perform the behavior. Examples are provided below.

When given a word bank, students will label all 5 components on a simple schematic circuit diagram.

When given a grocery list with photographs, the student will identify 9 out of 10 grocery items.

When given a calculator, the student will solve 4 out of 5 quadratic equations on a quiz.

How to Format and Submit Your Lesson Plan

Your lesson plan should be in 12-point Times New Roman font with 1" margins all around. All pages of the entire document should be numbered sequentially. Each of the sections of the document should be labeled with the appropriate heading from above and they should be presented in the order that they are presented above. Your lesson plan should include a cover page with a title, "***Guided inquiry Lesson Plan***" and the words "TLT 426– Dr. Bodzin" and your name. Label your file: *last name.doc* (for example my file would be called: *bodzin.doc*

Submit your lesson plan to the Assignment Submission Area in Coursesite.

Classroom Observation and Interview Report

Option 1 (if you are not an inservice teacher):
You will visit an elementary school classroom (grades 1-6) and **observe 4 different science lessons** and **interview** the classroom teacher. Ideally, you should observe the same teacher instruct the same group of students four different times. You will submit a report that describes your observations and your personal reflections and thoughts. Use the questions in the guideline below to focus your observations.
If you do not observe a specific aspect of the classroom noted below, talk to the classroom teacher about it so you can comment about it in your report.

Focus on the specific details from the criteria below in your report. Be sure to include insights into classroom implementation and discuss specific pedagogical strategies observed. I am especially interested in reading reflective comments and thoughts about your observational experiences.

Your report is to be completed in the format stipulated below. The report should be word-processed using 12 point, Times font, double-spaced type.

Be sure to include the type of class(es) you observed and the grade level. Please include the name of the school and school district.
Submit your classroom observation report to the Assignment Submission Area in Coursesite.

A. The Classroom:

• How are materials and seating arranged? Why? What materials do students have access to? Do restrictions exist for materials? What are they? Where are lab materials located?

• How does the organization of the classroom contribute to the teaching/learning atmosphere? Is the organization formal or informal? Why? Do students place finished assignments in specific locations?

• Do bulletin boards, learning centers or stations, or other displays contribute to: motivation? Curriculum-based topics? Are these areas easily accessed by students? When can students use them?

• Is the room stimulating and exciting? How can you tell? Does the room invite science learning? Is there a classroom library, science resource section, or activity center area? How is it used?

B. Teaching Strategies

• What procedures are routine? For example, how does the science lesson start and end? Is there an order or a sequence for the science activities?

• How and when does the teacher use: the board? visual aids? instructional technologies such as computers and calculators? video? texts? worksheets?

• When is group work utilized? Are cooperative learning strategies used? What rules exist for group situations?

• How does the teacher utilize questioning? How is discussion encouraged? Does the teacher encourage student reflection and expression of opinions?

• Is previous learning or prior knowledge utilized?

• Does the teacher vary voice inflections or tone? When and why? How does this contribute to motivation, discipline, and emphasis of content?

• How are students engaged in processes of scientific inquiry? Do students explore objects, events, and organisms in their environment? Do students develop and explain concepts in their own words, both orally and by writing and drawing?

• How is content information presented in a developmentally-appropriate and engaging fashion?

• How are learners with special needs accommodated? Be sure to include information pertaining to students with IEPs, gifted students, and English language learners with different language acquisition abilities? What about students who always complete their assignments before other students? Interview the teacher if needed.

• How are students provided opportunities to extend and elaborate their understanding and knowledge through independent inquiries?

C. Classroom Management

• What are the stated and unstated rules of this teacher? How can you tell? Are the rules uniformly and fairly applied? List as many rules as you can. Pretend that you need to inform a new student of what is acceptable. Can you do it? What happens if a rule is broken?

• What strategies does this teacher use to obtain student attention to begin and end class? What does the teacher do to use time effectively? How are transition times (moving from one activity to the next) minimized? How does organization of the classroom or of actual lessons contribute to decreasing discipline problems?

• When and how is praise or positive reinforcement used?

• What happens when there is an announcement or an interruption?

• Does the teacher use nonverbal signals or gestures to control student behavior? Which ones? Why? Does the teacher use proximity control (moving closer to a specific student in order to gain attention or stop some in appropriate conduct)? When and why?

D. The Students

• Who are the students? Include ethnicities, cultural backgrounds, and socio-economic status of the community. Can you identify students who are motivated or unmotivated to learn science? What can you tell about individual students by watching them? What interests do the students have? Which types of individual behaviors can you predict from certain students? Who is on-task? Who is off-task?

• Do any have IEPs (Individualized Education Plans) or any other special needs? Are any English Language Learners? How are they accommodated? Interview the teacher to acquire this information.

• Do any students appear to have health or emotional problems?

• Do any students misbehave? If so, why do you think they misbehave? Do they seek attention? Try to gain acceptance from peers?

E. Assessment Practices

• What types of **formative assessments** are used? How does the teacher use that information to inform teaching and/or influence learning? Provide specific examples. Interview the teacher to acquire this information.

• What types of **summative assessments** are used? Where do the summative assessment items come from? How is data from these assessments used for purposes of grading and accountability? How are final grades determined? Provide specific examples. Interview the teacher to acquire this information.

• How are assessment items designed to accommodate English language learners of different language ability levels? Interview the teacher to acquire this information.

• How are assessment items designed to accommodate students with disabilities? **Interview the teacher to**

acquire this information.

• How does the teacher prepare students for the PSSA Science Assessment? Are the science anchors used? ***Interview the teacher to acquire this information.***

F. Elementary Science Curriculum

In this section of your report, describe the science curriculum. ***Interview the teacher to acquire this information.***

• What is the curriculum? Does the school district use a local curriculum? What standards is the curriculum align aligned to? What topics are covered? How are the PA ELPs used to meet the needs of English Language Learners?

• Is the curriculum textbook-centered? What textbook is used? Are hands-on manipulative activities included in the curriculum? Does the district provide teachers with professional development to learn how to use curricular materials?

• Are there written goals and objectives for each unit?

• Does the curriculum include recommended assessments for each unit? Are teachers required to use these assessments?

• Does the curriculum integrate instructional technology or interdisciplinary activities? Does the curriculum focus on science process skills or the acquisition of science facts? Is a project-based approach to learning science used?

• What does the teacher do to enhance the school-mandated curriculum?

G. Personal Reflection

In this section of your report, reflect on your observations. What features of this classroom reflect a standards-based classroom as described in your course readings and class discussions? Provide specific examples. What types of modifications (including curricular customizations) can be done to make this classroom more aligned to the goals stated in the *National Science Education Standards*?

Option 2 (if you are an inservice teacher and do not have the opportunity to observe other elementary teachers of science):
Videotape 4 of your science lessons. Watch your lessons. Use the questions in the guideline in Option 1 to focus your observations. You will submit a report that describes your observations and your personal reflections and thoughts regarding your lessons. Your report should include each section from Option 1. The report should be word-processed using 12 point, Times font, double-spaced type.

Option 3 (if you are not an inservice teacher and do not have the opportunity to observe other elementary teachers of science due to time constraints with work or other obligations):

Write a 8-10 page research paper on the topic of:

1. Science misconceptions of elementary school aged children.
or
2. Teaching science to diverse elementary learners.

Your paper must contain a minimum of 8 references. 4 of these references must come from empirical research articles – these articles are written by researchers, not practicing classroom teachers. Examples of journals with empirical research articles include the Journal of Research in Science Teaching, Science Education, Journal of

Elementary Science Education, School Science and Mathematics, Journal of Computers in Mathematics and Science Teaching, Journal of Science Education and Technology and Journal of Science Teacher Education. Articles from *Science and Children* are **not** considered empirical research articles. The report should be word processed using 12 point, Times font, double-spaced type.

Web-facilitated Science Activity

Develop a Web-facilitated science activity that will be used by **elementary science students (grades 1-6)** to engage in a science-specific curricular topic of interest. Your science activity should enable students to use scientific process skills. These may include: observing, classifying, comparing, measuring, predicting, inferring, and communicating. Your science activity may take a variety of forms depending on the maximum grade you seek to obtain for this assignment – see chart below. **You will create a handout for your activity to be used for assessing student science learning**. **You will test out your Web-based science activity with an elementary school student or students and/or teacher and provide a brief report on its effectiveness in bringing about science learning.**

Activity Type	**Maximum Grade Possible**
Web- facilitated inquiry containing 4-5 essential features of inquiry	A
Web- facilitated inquiry containing 3 essential features of inquiry	A-
Activity that engages learners with authentic data or a simulation	B+
Structured guided investigation that uses guiding questions to focus student's explorations (such as an information-seeking *Webquest*)	B

In your submission, be sure to provide the **grade level** (*select only one target grade level*) and **subject** that this activity is intended for.

Your final grade will be determined by the following criteria:

1. Create a Web-facilitated science activity.

2. Provide a handout to assess student science learning. **Include an answer key** for your assessment.

3. Test out your activity with an elementary school student or students and/or teacher. Based on your feedback from your pilot-tester, revise your Web-facilitated activity as needed. Provide a brief report on its effectiveness in bringing about science learning with your pilot-tester and discuss how you revised your activity to enhance learning.

Examples of exemplary Web-facilitated science activities that contain all 5 essential features of inquiry from students previously in this course are located in the **Course Artifact Examples section of Coursesite**.

Ideas to get you started:

Use specific areas of the WhaleNet Web site (**http://whale.wheelock.edu/)** to have students compare characteristics of marine mammals or migration patterns.

Use the still images and QuickTime Virtual Reality panoramas in the Carolina Coastal Photojournal (**http://www.ncsu.edu/coast/pjournal/index.html**) to have students compare similarities and differences in the amount of sand, visible waves, and plant cover between the ocean side and marsh side of the same barrier island.

Have students explore designated areas the Electronic Zoo (**http://netvet.wustl.edu/ssi.htm**) to compare and contrast different characteristics of animals.

Have students compare and contrast different types of volcanoes from different parts of the world. VolcanoWorld (**http://volcano.und.nodak.edu/)** is a good starting place to guide students in their explorations.

How to Format and Submit Your Web-facilitated science activity

Your Web-facilitated science activity should be in 12-point Times New Roman font with 1" margins all around. All pages of the entire document should be numbered sequentially. Each of the sections of the document should be labeled with the appropriate heading from below and should be presented in the order that they are presented below.

I. Web-facilitated science activity. This is the activity that students will receive.

II. Handout to assess student science learning.

III. Answer key to the handout that assesses student science learning.

IV. Brief report on the Web-facilitated science activity's effectiveness in bringing about science learning with your pilot-tester and discussion on how you revised your activity to enhance learning.

Your Web-facilitated science activity should include a cover page with a title, "***Web-facilitated Science Activity***" and the words
"TLT 426– Dr. Bodzin" and your name. Label your file: *last name.doc* (for example my file would be called: *bodzin.doc*

Submit your Web-facilitated science activity to the Assignment Submission Area in Coursesite.

Science Instructional Unit and Planning Outline Assignments

You will create an instructional resource unit to be used in teaching a science topic in an elementary school science class. Your instructional unit will contain:

- A comprehensive unit planning outline that serves as a resource for the entire unit
- A minimum of **5 lesson plans using the lesson plan format on pages 10-12 in the syllabus.**
- Integration of reading, writing, mathematics, and literature into your unit.
- At least **one lesson that incorporates instructional technology** into the unit (Web-facilitated activity, hand-held data collection probeware, hypermedia, software, etc.).
- **At least 2 authentic assessment instruments that must include 1 rubric**.
- An **end of the unit test** for the unit that incorporates a mixture of traditional assessment type items (i.e. multiple choice test items) and non-traditional assessment items (i.e. design problems). Your test should include a minimum of 10 multiple-choice items and at least 2 open-response items. Include an **answer/scoring key** for this unit summative assessment. Detailed scoring criteria should be included for each open-ended assessment item.

An artifact submitted for other course assignments may not count as part of the requirements for the resource unit.

Your curricular resource unit is to be completed in the format stipulated below. Points will be deducted for not adhering to the assigned format.

Examples of exemplary Science Instructional Unit and Planning Outline assignments are located in the **Course Artifact Examples section of Coursesite**.

Science Instructional Unit Planning Outline

Please submit this assignment in the format stipulated below.

A. **Grade level and topic**.

B. **Overarching understandings**. What **overarching understandings** are desired? What will students understand as a result of this unit?

C. **Essential questions**. What are the **overarching "essential" questions of the unit?** What **"essential"** and **"unit"** questions will focus this unit? List the questions you will ask to determine whether the students understand the material studied and whether they can apply what they have learned.

D. **Assessment methods for gathering evidence.** What evidence will show that students understand _____? List performance tasks, projects, quizzes, tests, academic prompts, and other evidence (e.g. observations, work samples, dialogues) that you will use to assess learner understandings.

E. **Learning objectives**. Given the target understandings, other unit goals, and the assessment evidence identified, what knowledge and skills are needed? Specify what students ***need to know*** (facts, concepts, principles, generalizations) and ***be able to do*** (skills, process, and strategies) to demonstrate their understanding through performance.

Students will understand …….
Students will be able to…..

F. **Learning Experiences**. What teaching and learning experiences will equip students to demonstrate the targeted understandings?
Be sure to **clearly articulate** your activity implementation ideas for each of your intended lessons. Do not just state a title of an activity. Briefly explain what students will do in the activity to learn a science concept. It is recommended that you use a bulleted brief description list for each day of your unit.

For example….

Day 1:
• Present the story of the sailors' "mystery disease" (scurvy).
• Introduce essential and unit questions and key vocabulary terms.
• Present concept attainment lesson on food groups, then categorize foods into groups – fats, proteins, and carbohydrates.

Day 2:
• Have students read and discuss the nutrition brochure from the USDA.
• Present lesson on the food pyramid and identify food in each group.
• Have students test food for the presence of carbohydrates using "the starch test" with iodine.

Day 3:
• Web-facilitated activity on building balanced meals. Students will go to the Burger King Web site and plan a balanced meal based on a given amount of calories, fats, protein, and carbohydrates.

[Continue for each day of your unit.]

G. Consideration of **Safety Precautions**. What, if any, special considerations should be made about safety?

H. Consideration of **Special Students**. Describe variations on the lessons you would implement for special students with disabilities and ELL students.

I. **Integrated Activities**. Outline integrated activities you wish to use throughout the unit. For the most part, these activities will be broad-based, covering a range of curricular areas including mathematics, social studies, language arts, and art. Refer to the Martin text for examples. **Clearly state** how these are integrated into other discipline areas. You may also discuss how activities in a math or language arts class session is integrated to your science unit.

J. **Literature Selections**. Select books related to the topic of the unit. For your literature selections you may wish to develop a pre-reading activity, a variety of cross-curricular learning activities, and open-ended discussion questions. Select books from a variety of genres. Specific activities integrating literature should be described here. Refer to the Martin text for examples.

K. **Materials and Resources.** It is advantageous to determine necessary materials and resources to assist in the implementation of your unit. This way, you avoid limiting yourself to a few familiar items. Many of these items can be used in activity centers or for extension activities. Resources for your own personal planning use may also be listed.

Be sure to use APA style for each of your references.
A fairly complete list of how to cite materials in APA format is available in the Course Website.

For Internet resources, here is an acceptable format I would expect you to use:

Carolina Coastal Science. (1998). NC State University: Bodzin, Alec M. Retrieved September 28, 2000 from the World Wide Web: http://www.ncsu.edu/coast

For Internet resources, make sure you include the Web site title, published date, publisher, author, date retrieved, and Web address (URL).

a. Printed Resources. Printed Resources. Books, textbooks, curricular enhancement modules, pamphlets, journals, maps, encyclopedias, magazines, booklets, professional journals. (**List at least 3**)

b. Internet Resources. Include simulations, educational games, visualizations, and video clips related to curriculum. (**List at least 8**).

How to Format and Submit Your Science Instructional Unit Planning Outline

Your *Science Instructional Unit Planning Outline* should be in 12-point Times New Roman font with 1" margins all around. All pages of the entire document should be numbered sequentially. Each of the sections of the document should be labeled with the appropriate heading from above and they should be presented in the order that they are presented above. Your *Science Instructional Unit Planning Outline* should include a cover page with a title, "Science Instructional Unit Planning Outline" and the words "TLT 426– Dr. Bodzin" and your name. Label your file: *last name.doc* (for example my file would be called: *bodzin.doc*

Submit your Science Instructional Unit and Planning Outline to the Assignment Submission Area in Coursesite.

Science Instructional Unit

Your science instructional unit must contain:

- **5 lesson plans** using the lesson plan format on pages 10-12 in the syllabus.
- Integration of reading, writing, mathematics, and literature into your unit,
- At least one lesson that incorporates instructional technology into the unit (Web-based activity, hand-held data collection probeware, hypermedia, software, etc.).
- At least 2 authentic assessment instruments that must include 1 rubric.
- An **end of the unit test** for the unit that incorporates a mixture of traditional assessment type items (i.e. multiple choice test items) and non-traditional assessment items (i.e. design problems). Your test should include a minimum of 10 multiple-choice items and at least 2 open-response items. Include an **answer/scoring key** for this unit summative assessment.

A rubric is available on the Coursesite that will be used to assess this activity.

Examples of exemplary Science Instructional Units are located in the **Course Artifact Examples section of Coursesite**.

An artifact submitted for other course assignments may not count as part of the requirements for the resource unit with the exception of your Web-facilitated Science Activity.

Lesson plans

Your resource unit must contain at least 5 lesson plans. The lesson plans must show developmentally sound scope and sequence to the content and concepts that are presented. You may get ideas from other places but do NOT just zerox intact lesson plans from somewhere else.

• Your selected assessments must correlate with your objectives.

• Each lesson plan must clearly articulate both formative and summative assessments.

• Each lesson plan must include summative assessment items from the end of unit test.

• Be sure to include student worksheets, data tables, copies of lecture notes, or other handouts to each individual lesson plan as applicable. These ancillary materials must be included at the end of each individual lesson plan. (The course instructor will not spend time looking for them if they are not placed at the end of each individual lesson).

Note: If you are unable to produce ancillary materials in MS Word document format, you may provide these as PDF file documents and submit them as a second file.
Clearly label each document so the course instructor knows which specific lesson plan it corresponds to.

How to Format and Submit Your Science Instructional Unit

Your ***Science Instructional Unit*** should be in 12-point Times New Roman font with 1" margins all around. All pages of the entire document should be numbered sequentially. Each of the sections of the document should be labeled with the appropriate heading from below and should be presented in the order that they are presented below.

I. Lesson Plan #1 with ancillary materials for this lesson (if appropriate).

II. Lesson Plan #2 with ancillary materials for this lesson (if appropriate).

III. Lesson Plan #3 with ancillary materials for this lesson (if appropriate).

IV. Lesson Plan #4 with ancillary materials for this lesson (if appropriate).

V. Lesson Plan #5 with ancillary materials for this lesson (if appropriate).

VI. Include descriptions of additional lesson plans as appropriate if your unit is more than a 5-day sequence. Note: Only 5 full lesson plans are required for your science instructional unit submission.

VII. End of the unit test.

VIII. End of the unit test scoring key.

Second file. (If needed). Ancillary materials for the lesson plans. PDF file document. Clearly label each ancillary material so the course instructor knows which specific lesson plan it corresponds to. For example, if a diagram is provided for Lesson Plan #2, on the page before the diagram include a page that states: "Diagram for Lesson Plan #2".

Your ***Science Instructional Unit*** should include a cover page with a title, "Science Instructional Unit" and the words "TLT 426– Dr. Bodzin" and your name. Label your file: *last name.doc* (for example my file would be called: *bodzin.doc*

If you submit a second file of ancillary materials, label this file: *last name_ancillaries.doc* (for example my file would be called: *Bodzin_ancillaries.doc*

Submit your Science Instructional Unit and Planning Outline to the Assignment Submission Area in Coursesite.

Pennsylvania Department of Education Program Standards for Elementary Teacher Certification and Preparation

Competency	Artifact/activity that demonstrates competency
I. CONTENT KNOWLEDGE Candidates demonstrate their knowledge of the fundamental concepts of Elementary Education and competence in applying developmentally appropriate practices to meet the diverse needs of all elementary students (K-6) including:	
I.A. Growth development and learning including: I.A1. Cognitive development and theories of learning.	Martin text chapters, Course readings, and Website handouts on cognitive development and learning theories.
I.B. Methods and issues of assessment and evaluation including: I.B1. Diagnostic, formative, and summative instruments. I.B2. Formal, informal and authentic assessment procedures. I.B3. Biases, tracking, labeling and lowered expectations. I.B4. Aligning assessment to teaching and learning of special needs students.	Martin text chapters, Course readings, and Website handouts on assessment and evaluation. Authentic assessment and rubric development course activities. Guided Inquiry Lesson Plan and Science Instructional Unit assignments.
I.E. Science instruction at the elementary in accordance with the Pennsylvania Academic Standards including: I.E1. Integrated concepts and processes of earth/space, life and physical sciences. I.E2. Current instructional technologies, hands-on science activities and direct and inquiry teaching strategies. I.E3. Scientific, societal, environmental and ethical problems and issues.	Martin text chapters, Course readings, and Website handouts on inquiry-based teaching methodologies, constructivism, instructional delivery, designing learning environment, Web-based inquiry, and STS role-playing simulations. Course activities including microteaching, FOSS Kit activities, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons, hands-on science activities, and Web-based instructional materials located on course Websites. Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments.
PERFORMANCE Candidates demonstrate their knowledge and foster student learning through:	
II.A. Managing the instructional environment including: II.A1. Creating a positive, inclusive learning environment. II.A2. Establishing and maintaining rapport with all students. II.A3. Communicating high learning expectations to all students. II.A4. Establishing and maintaining fair and consistent standards of classroom behavior. II.A5. Creating a safe physical environment that is conducive to learning.	Martin text chapters, Course readings, and Website handouts a classroom environment, classroom management, and safety in the science classroom. Course activities including microteaching, FOSS Kit activities, inquiry-based classroom lessons, and hands-on science activities. Science Instructional Unit assignment.
II.C. Computer-mediated communications and emerging technologies including: II.C1. Audio-visual hardware and other presentation tools. II.C2. Productivity tools. II.C3. Internet searches and electronic mail.	Martin text chapters, Course readings, and Website handouts on incorporating instructional technologies into the curriculum. Course activities including microteaching, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons using spreadsheets and databases, and Web-based instructional materials located on course Websites utilizing interactive java applets, GIS, QuickTime VR, Flash interactivies, and Web-based data submission forms.

	Guided Inquiry Lesson Plan, Web-based Science Exploration and Science Instructional Unit assignments.
II.D. Selecting, implementing and adapting effective instructional strategies, curriculum resources and technologies in collaboration with other educators to meet the needs of diverse learners including: II.D1. Assessing, identifying and building on the students' prior knowledge, experiences and skills in each content area. II.D2. Problem analysis, creativity, problem-solving, and decision-making skills. II.D3. Inquiry, direct instruction and cooperative learning.	Martin text chapters, Course readings, and Website handouts on incorporating instructional strategies, assessment, curriculum resources and technologies to meet the needs of diverse learners. Course activities including microteaching, FOSS Kit activities, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons using spreadsheets and databases, and Web-based instructional materials located on course Website. Guided Inquiry Lesson Plan, Web-based Science Exploration and Science Instructional Unit assignments.
II.E. Developing, utilizing, and communicating appropriate measurement and evaluation procedures in the instructional program.	Martin text chapters, Course readings, and Website handouts on assessment and rubrics. Web-facilitated Science activity.
II.F. Monitoring students' understanding of content, providing feedback to students and adjusting instructional strategies as needed.	Martin text chapters, Course readings, and Website handouts on the elementary science classroom. Microteaching course activity.
III. PROFESSIONALISM Candidates demonstrate knowledge of and competence in fostering professionalism in school and community setting including:	
III.A. Professional organizations and professional journals.	Class discussions and course readings.

354.32 MONITORING AND ASSESSMENT	**Artifacts/activities that demonstrates competencies**
(1) The progress of candidates at different stages of the program shall be monitored through performance-based assessments, which shall stipulate the level of competence required to ensure success in the following skill dimensions:	Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments. Course activities including microteaching, assessment and rubric development, inquiry-based classroom lessons, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons using spreadsheets and databases, evaluating the quality of instructional support instrument, and implementation of Web-based instructional activities located on course Websites. Martin text chapters, Course readings, class discussions, and Website handouts on assessment and evaluation, classroom environment, classroom management, and safety in the science classroom.
(i) Content mastery	
(ii) Planning	
(iii) Classroom management	
(iv) Organization	
(v) Monitoring student progress	
(vii) Sensitivity to students' needs	
(viii) Problem analysis	
(ix) Strategic and tactical decision making	
(x) Oral and written communication and presentation	
(xii) Mastery of instructional technology	

354.33 PROFESSIONAL COMPETENCY (1)*(i) Instructional*	**Artifacts/activities that demonstrates competencies**
(A) The teacher understands the central concepts, tools of inquiry, and structures of the discipline the teacher teaches and can create learning experiences that make these aspects of subject matter meaningful for all students.	Martin text chapters, Course readings, and Website handouts on inquiry-based teaching methodologies, constructivism, instructional delivery, designing learning environment, Web-based inquiry, STS role-playing simulations, and Project WILD activities. Course activities including microteaching, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons, hands-on science activities, and Web-based instructional materials located on course Websites. Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments.
(B) The teacher understands how all children learn and develop, and can provide learning opportunities that support their intellectual, social, career and personal development.	Martin text chapters, Course readings, and Website handouts on cognitive development and learning theories.
(C) The teacher understands how students differ in their ability and approaches to learning and creates opportunities that foster achievement of diverse learners in the inclusive classroom.	Martin text, Course readings, and Website handouts on incorporating instructional strategies, assessment, curriculum resources and technologies to meet the needs of diverse learners. Course activities including microteaching, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons using spreadsheets and databases, and Web-based instructional materials located on course Website. Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments.
(D) The teacher understands and uses a variety of instructional strategies, including interdisciplinary learning experiences, to encourage students' development of critical thinking, problem solving and performance skills.	Martin text chapters, Course readings, and Website handouts on inquiry-based teaching methodologies, constructivism, instructional delivery, designing learning environment, Web-based inquiry, STS role-playing simulations, and Project WILD activities. Course activities including microteaching, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons, hands-on science activities, and Web-based instructional materials located on course Websites. Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments.
(E) The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning and self-motivation.	Martin text chapters, Course readings, and Website handouts on classroom environment and classroom management. Course activities including microteaching, inquiry-based classroom lessons, and hands-on science activities. Science Instructional Unit assignment.
(F) The teacher uses knowledge of effective verbal, nonverbal and media communication techniques supported by appropriate technology to foster active inquiry, collaboration and supportive interaction in the classroom.	Martin text chapters, Course readings, and Website handouts on incorporating instructional strategies, assessment, curriculum resources and technologies to meet the needs of diverse learners. Course activities including microteaching, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons using spreadsheets and databases, and Web-based instructional materials located on course Website. Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments.

(G) The teacher plans instruction based upon knowledge of subject matter, students, the community and curriculum goals.	Martin text chapters, Course readings, and Website handouts on inquiry-based teaching methodologies, constructivism, instructional delivery, designing learning environment, Web-based inquiry, STS role-playing simulations, and Project WILD activities. Course activities including microteaching, Web-based inquiry analyses, probeware data collection activities, inquiry-based classroom lessons, hands-on science activities, and Web-based instructional materials located on course Websites. Guided Inquiry Lesson Plan, Web-facilitated Science Activity and Science Instructional Unit assignments.
(H) The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.	Martin text chapters, Course readings, and Website handouts on assessment and evaluation. Assessment and rubric development course activities. Guided Inquiry Lesson Plan and Science Instructional Unit assignments.
(I) The teacher thinks systematically about practice, learns from experience, seeks the advice of others, draws upon educational research and scholarship and actively seeks out opportunities to grow professionally.	Introduction to state and national science education professional organizations.