SCHOOL OF NATURAL RESOURCE SCIENCES

ASSMENT REPORT

2009-2010

Prepared by:
Don Kirby

Assessment Outline

School of Natural Resource Sciences **Prepared by: Don Kirby**

Level: Bachelors **Date: June 2010**

Intended Student Outcomes	**Type of Assessment**	**Conditions for Assessment** (to whom; when)	**Date Results Available**
1. Appreciate student's concerns and background as a component of class instruction.	a) class survey	a) all majors by: all teaching faculty	a) at beginning of semester
2. Understand and synthesize the physical, chemical and biological aspects of soil science' natural resources management; rangeland ecology and management; insect ecology and integrated management and closely associated fields. Students will be able to identify and understand common problems related to the various uses of soil and rangeland resources and make appropriate management recommendations. Students must be able to locate, organize, evaluate and interpret appropriate sources of information.	b) term papers c) senior capstone course projects d) field experience e) seminar oral report f) seminar written report g) graduation exit survey	b) all majors c, d, e, f, g) all majors by: b, d, e) all teaching faculty f, g) instructor g) chairman	b,c,d,e,f) end of semester g) at graduation

Assessment Outline

School of Natural Resource Sciences **Prepared by: Don Kirby**

Level: Masters **Date: June 2010**

Intended Student Outcomes	Type of Assessment	Conditions for Assessment (to whom; when)	Date Results Available
1. Appreciate student's concerns and background as a component of class instruction.	a) class survey	a) all majors by: all teaching faculty	a) at beginning of semester
2. Develop detailed knowledge in one or more areas of the physical, chemical or biological aspects of soil science, rangeland ecology and management, natural resources management, and insect control and management.. Students will be capable of investigating problems related to use of soil and rangeland resources, insect ecology, or natural resources management.	b) term paper c) seminar oral report d) seminar written report e) master's oral examination f) thesis g) graduation exit survey	b) all majors c through g) all majors by: b,c) all teaching faculty d) instructor e,f) graduate committee, chairman g) chairman	b,c,d) end of semester e,f,g) near graduation

Assessment Outline

School of Natural Resource Sciences

Prepared by: Don Kirby
Date: June 2010

Level: Doctoral

Intended Student Outcomes	Type of Assessment	Conditions for Assessment (to whom; when)	Date Results Available
1. Appreciate student's concerns and background as a component of class instruction	a) class survey	a) all majors by: all teaching faculty	a) at beginning of semester
2. Develop detailed and intimate knowledge along with philosophical understanding of all areas in the soil, range science, natural resources management or entomology disciplines with a particular emphasis leading to professional expertise. Students will be able to develop new hypotheses and knowledge in a particular area of emphasis.	b) term paper c) seminar oral report d) seminar written report e) doctoral written examination f) doctoral oral examination g) dissertation h) graduation exit survey	b through h) all majors by: b,c) all teaching faculty d) instructor e) examining committee f, g) graduate committee, chairman h) chairman	b,c,d) at end of semester e, f, g, h) near graduation

2009 Assessment Report

FROM: Entomology Department
Natural Resources Management Program
Range Science Program
Soil Science Department
School of Natural Resource Sciences

TO: Office of Assessment and Institutional Research

Outcome No. 1. Appreciate students concerns and background as component of class instruction.

The following courses in the School of Natural Resource Sciences initiated an assessment tool and are included in the following report:

ENT 210 Insects - Humans and the Environment – Marion Harris

Assessment of student learning is an important feature of my General Education course. It occurs at the beginning of each class, when students have a short quiz on the reading they prepared for class (an article or chapter from a book). At the end of each class, there is a quiz on material we discussed in class that day. This gives me a sense of whether they have grasped major concepts and terminology. Finally there are three exams that cover material in that section of the class, with the emphasis here being broad concepts.

What Did You Do?

To additionally assess student learning during the first third of the class, I gave a pre-test during the first class and then tested students again on these questions during the first exam at the beginning of February. The students were assured that their performances on the pre-test would not affect their grades in any way.

What Did You Learn?

Students did significantly better on the post-course test, more than doubling their scores. The difference was highly significant ($P < 0.001$).

Category	Pre-Course Score	Post-course Score
Number of students	45	44
Possible points	80	80
Mean score	24	70
Standard deviation	3.45	4.21
Highest score	35	76
Lowest score	9	61

What Will You Do Differently as a Result of What You Learned?

Each year I also assess how the class went and myself as a teacher (in a qualitative fashion) and come up with changes for the next time I teach. I also use comments on SROIs to figure out what changes need to be made. These changes will be as follows.

1) Students read two books in my class, one about insects that transmit diseases to humans and one about behavioral genetics. The students much prefer the first book, so this year I started them off by reading this book. The problem with this is students seem to get grumpier (or at least less focused) as the semester progresses. Thus, with this order of books, the harder second book coincides with their increasing grumpiness. Next year, I will revise the order in which the books are read. This will make the students more aware of the fact that we will spend a considerable period of time talking about a single insect, the fruit fly, because of its role in the revolution in genetics and molecular biology.
2) I will add 4-5 more lectures to discuss *Time Love Memory*. This year I felt that I rushed through this book. Many interesting questions about the differences between insects and humans are raised by this book, questions about where we as a society are going with genetics, for example, do will we permit selective breeding of humans and altering human genetics?
3) I will drop the third book on monarch butterfly migration. Most students felt this book covered topics on science that were already covered in *Time Love Memory.*

ENT 350 - General Entomology - Deirdre Prischmann-Voldseth

When I started at NDSU as an Assistant Professor in Fall 2008, I began the process of updating and improving ENT350, General Entomology. Modifications were undertaken because the supporting course material (i.e. lectures, labs) were outdated and feedback from students and faculty advisors indicating that as a 5 credit course ENT350 covered an unrealistic, overwhelming amount of information. Previously, this course was split into two 8-wk sections. The first dealt with general Entomology, and the second covered pest management – topics that could easily be stand-alone classes. Feedback from faculty within programs that require the class were supportive of change, and indicated that a 3 credit course would be preferable. The issue was discussed with the Entomology faculty, and all faculty members agreed with the proposed changes.

<u>What Did You Do?</u>

Therefore, I changed ENT350 to a 3 credit course that focuses on the fundamentals and core concepts of Entomology and reworked the entire syllabus. Fall 2009 was the first time I taught the updated course. Students attended two 1-hr lectures and one 2-hr lab each week. For the updated class, I 'retired' the old course material and created all new lectures with an emphasis on linking Entomology to other subjects (e.g. history, medicine, art, farming, human anatomy) and adding engaging visuals and multimedia (video and sound clips). In addition, I reworked the labs, including organizing materials and specimens, revising all lab worksheets, and creating new lab units (e.g. overview of collection methods, use of dichotomous keys for insect identification). All course materials, including lecture powerpoints, were posted on Blackboard. Learning was assessed via three lecture exams (including the final), weekly lab worksheets and quizzes, a final lab practical, and an insect collection. Grades on major class assignments are found in Table 1. Due to overall poor performance on the first exam, an extra credit take-home assignment was developed, exam study guides were handed out prior to subsequent tests, and time was set aside for in-class review.

One way I assessed student comprehension was by giving students a non-graded quiz at the start of the semester (Initial Knowledge Survey). The quiz consisted of five multiple choice and three fill in the blank questions.

What Did You Learn?

I then gave the students the same quiz at the end of the semester (Final Knowledge Survey) and compared the results (Table 2, Fig. 1). Overall, students had significantly higher mean scores on the Final Knowledge Survey ($P < 0.001$), including multiple-choice ($P < 0.001$) and fill in the blank questions ($P < 0.001$; 2-sided t-test; Table 2). Total scores on the Final Knowledge Survey were related to a student's final grade ($P < 0.001$; linear regression; Fig. 1).

In addition to formal course and instruction assessment at the end of the semester, student feedback was obtained several times during the semester. Overall, it appeared that many students felt the course was too much work and that they did not fully understand all of the course content. Formal evaluations of the course were generally positive: Delivery = 4.13, Design = 4.22, Outcome = 3.75 (mean score, 5 being the highest).

What Will You Do Differently as a Result of What You Learned?

Lecture plans:

- Refine the material presented in lecture, including eliminating extraneous material, focusing on the most relevant topics, and using cross-discipline examples/stories.
- Have more of an emphasis on class discussions (entire class and small group).
- Have more frequent exams with fewer questions.

Lab plans:

- Review important structures at the start of lab using a camera hooked up to a microscope.
- Revise lab handouts and eliminate extraneous material.
- Create new, more hands-on lab units.
- Shorten and refine the lab practical.
- Add in more pest management information/specimens and show examples of plant damage.
- Alter the requirements for an insect collection and have more time to work on the assignment in lab.

Table 1. Grade assessment for major class assignments. Numbers reflect the total number of students in each grade category.

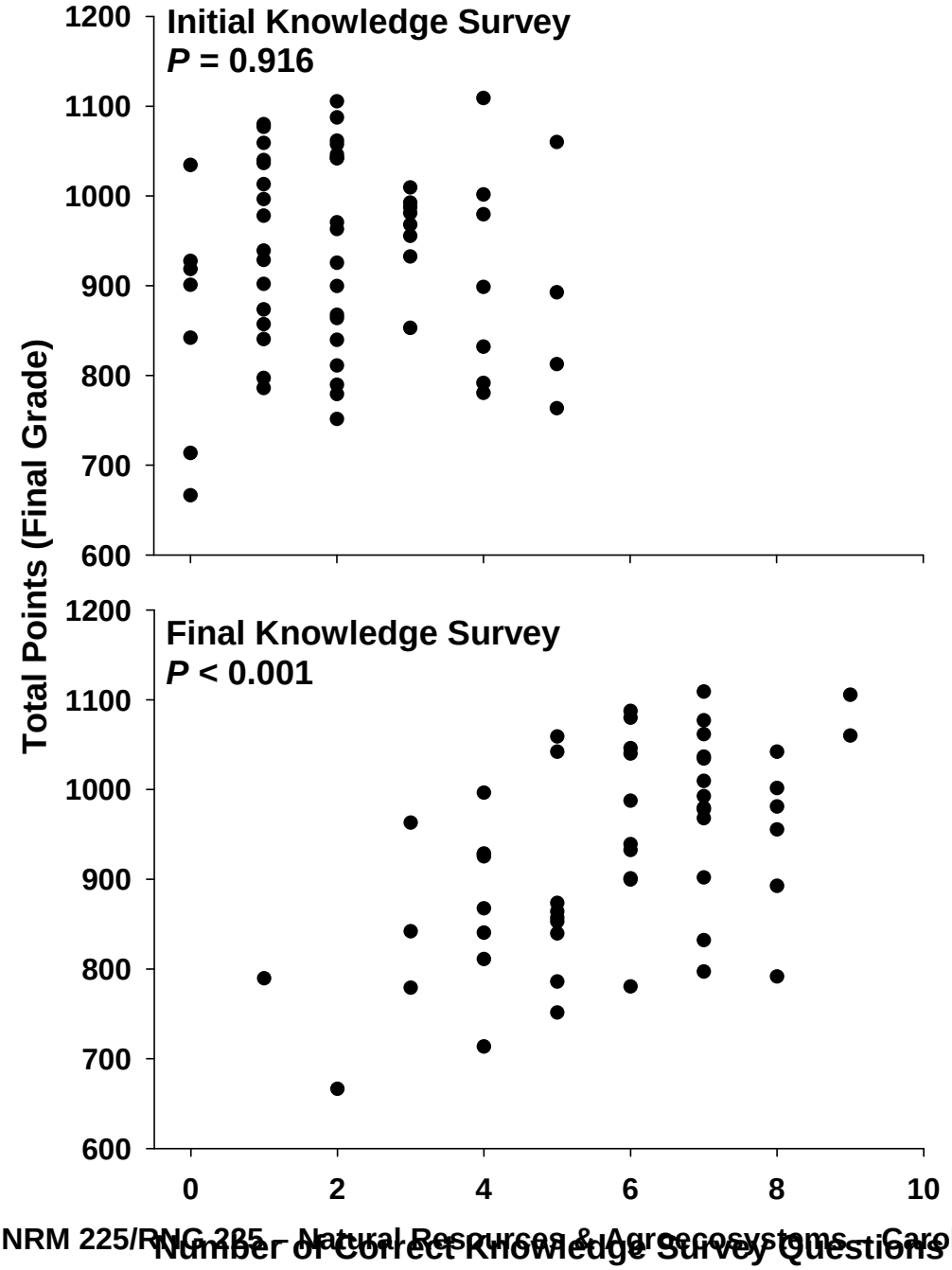
	A	**B**	**C**	**D**	**F**
Exam I	7	10	7	13	25
Exam II	30	20	3	5	2
Final Exam	43	14	2	0	0
Lab Practical	20	9	14	10	6
Insect Collection	40	5	2	5	8
FINAL GRADE	38	13	8	1	0

Table 2. Results from a knowledge survey given at the start and end of the semester.

	Initial Knowledge Survey	**Final Knowledge Survey**

	Multiple-choice	Fill in the blank	Total	Multiple-choice	Fill in the blank	Total
Possible points	5	3	8	5	3	8
Mean score	1.4	0.4	1.8	3.6	1.9	5.5
Highest score	4	1	4	5	3	8
Lowest score	0	0	0	1	0	1
Number of students	63			53		

Fig. 1. Correlation between knowledge survey results and total points accumulated during the class.



The objectives of this course are to present and clearly explain basic ecological concepts in an introductory context to students who have little or no background in the science of Ecology. To clearly define these concepts as they occur in natural ecosystems and compare/contrast these concepts as they occur in production and sustainable agro-ecosystems. To develop coherence in the explanation of these concepts which facilitates and challenges students to make connections between these concepts and case studies in Natural Resources Management. To have students become aware of current and potential environmental problems and the challenges with which they must be prepared to contend as natural resources managers.

What Did You Do?

An assessment of student learning is conducted as a "pre-course assessment" administered on the first day of class, an "interim-course assessment" administered mid-point in the course, and a "post-course assessment" administered during the last two weeks of the semester. These assessments focus on the student's evaluation of their personal learning achievements relative to the material presented in this course. Other assessment tools, adapted and developed for use in this course is a designated "Sequential-Course Assessment" (RSQC2) and a course-comprehensive assignment that allows students to apply various concepts presented in this course in an analysis of the Maya use of agriculture. Another assessment tool is the "Ecological Footprint" which is available on several websites for educational use and allows the students to assess their personal utilization of natural resources. These assessment tools are discussed in detail in the following section.

The pre-course assessment consisted of ten questions designed to measure the student's general knowledge about the science of ecology and the environment. The interim-course assessment and the post-course assessments consisted of the same ten questions, as follows:

• A basic tenet of Systems Ecology is _____.

• The view that humankind's proper role on Earth is to extend our power over nature as far as possible, is termed: _____.

• What do you know about the Gaia Hypothesis?

A. Never heard of the Gaia Hypothesis
B. Am somewhat familiar with the Gaia Hypothesis
C. Know enough about the Gaia Hypothesis to have an intelligent conversation. - 15 -
D. Have read several books about the Gaia Hypothesis.

• Nitrogen gas comprises approximately ____% of the atmosphere.

• Most biological activity occurs within the range of ___ degrees Celsius to ___ degrees Celsius.

• The "rain shadow" effect occurs as a result of this type of precipitation: _____.

• This principle states that two different species cannot occupy the same niche without some conflict: _____.

• In scientific research, the clearly stated testable idea is termed an (a) _____.

• Humans created agriculture approximately _____ years ago.

• The human population on planet Earth is approximately _____.

_____

What Did You Learn?

A comparison of the results from the first 10 questions of the pre-course assessment, interim-course assessment and the post-course assessment are as follows:

Percentage of students correctly answering the above ten questions. A comparison of Pre-course, Interim-course, and Post-course assessments for Spring Semester 2010.

Assessment	Mean Score
Pre-	45%
Interim-	61%
Post-	70%

The average score for the pre-course assessment was 45% in 2010 as compared with 46% in 2009 as compared with 48% in 2008 as compared with 41% in 2007 as compared with 47% in 2006, 44% in 2005 and 53% in 2004. The average score for the post-course assessment in 2010 was 70%, as compared with 70% in 2009 as compared with 74% in 2008 as compared with 73% in 2007 as compared with 71% in 2006, 73% in 2005 and 73% in 2004. The Interim-Course Assessment for 2010 showed an average score of 61% as compared with 65% in 2009 as compared with a score of 56% in 2008. This demonstrated a positive progression of understanding with increasing scores from 45% to 61% to 70% as the semester progressed. The students demonstrated a significantly higher understanding of the material on the post-course assessment as compared with the pre-course assessment; this was the expected response.

RSQC2 Assessment Tool

What Did You Do?

An assessment tool was implemented for Spring Semester 2007 and continued in use for Spring Semester 2008, 2009, and 2010. This assessment tool is a common assessment tool described in various forms on several websites where it is designated an “RSQC2 Comprehensive Assessment.” This assessment tool is administered five times throughout the semester. This tool consists of a one-page sheet of questions as indicated below.

RSQC2 Comprehensive Assessment

Reference: Angelo, T.A. & Cross, K.P. Classroom Assessment Techniques: A Handbook for College Teachers, 2nd edition. San Francisco: Jossey-Bass, 1993, pp. 344-348.

1. Take 1 minute to Recall and list in rank order the most important ideas from the previous day's lecture.
2. Take 2 minutes to Summarize those points in a single sentence.

3. Write one major Question that you want answered.
4. In a few sentences, identify a thread or theme to Connect this material to the course's major goal. Exactly what is the relationship of this topic to the overall course plan? Why is this material important? Course Goal: Enhance your understanding of basic ecological principles as they occur in nature and in agro-ecosystems, expand your perspective regarding current issues of ecological interest and define your role as one of the life forms living on an island in the Universe i.e., this planet Earth.
5. Add a Comment regarding your degree of confidence in your understanding of the specific course content.

What Did You Learn?

Application of this tool was successful in that it offers the students an opportunity for immediate self-assessment of a learning experience. The student's answers were not simply "yes" or "no," but were thoughtful expository responses highly reflective of the lecture's content. This seemingly simple tool generated a profound impact on the student's participation in classroom discussion and discussions among small groups of students when the class session ended. Upon reviewing the assessments, it also allowed the instructor to gather data useful at the next class session for clarifying misunderstood concepts and generating discussion in response to a student's written query. This sequential course assessment tool has proven itself to be an invaluable addition to the assessment process and will continue to be enhanced for utilization in succeeding semesters.

Case Study and Concept Mapping Assessment Tool

What Did You Do?

An additional assessment tool was adapted and implemented to assess the students understanding of how ecological principles apply to managed agro-ecosystems. This assessment tool also introduced students to a powerful application of "concept mapping." This assessment tool was adapted and modified from the Ecological Society of America website, which presented an array of assessment tools for education use. This assessment tool is offered as an extra-credit assignment.

Case Study: Unraveling the Mystery of the Mayans using GIS

Photo: http://www.guidetobelize.info/en_maya.html

Objectives: Upon completion of this assignment, you will be able to:

• Identify and illustrate how knowledge of ecological principles helps us in understanding the past and planning for the future.

• Recognize how GIS works and illustrate its many applications.

• Formulate a persuasive argument on how new knowledge from a variety of disciplines, combined with new technology, can be applied toward managing agro-ecosystems today.

This is a three-part assignment involving concept mapping and essay writing. Read through the entire assignment carefully before you begin putting ideas to paper. Your work is to be completed independently and is worth 6 points. All three parts are due at the beginning of class on the designated date (see syllabus; late assignments will not be accepted) Project presentation:

- Draw each concept map on a plain, white, 8 ½ x 11 piece of paper.

- Essay should be typed; double-spaced; use Times New Roman font size 12.

- Staple pages together; write your name in the top right corner of the ***back*** side of each project page.

Concept Mapping

Refer to the attached materials for explanation and examples of these maps.

1. Create a Mayan Empire concept map. Using *Mayan Empire* as the key word, explore a minimum of 5 threads and nodes and expand on each. Research the mystery surrounding the collapse of the Mayan Empire via the Internet. Ask yourself questions throughout the process to assist you in: expanding on knowledge you may already have about the topic, applying and using information you have learned in class, and thinking "outside the box" about theories, supporting evidence, etc. Here are a few to get you started:

• Where can I find credible, scientific information about this topic?

• When and where did the Mayan civilization exist?

• What are the theories about its collapse?

• How is modern technology assisting in understanding the past?...the future?

• What is the relationship between civilization collapse and what I have learned in this course?

• How does this affect me? My country? My world? Future generations?

Below is an article on NASA's site to get you started. Keep track of websites that contain information you want to cite in your essay.
http://science.nasa.gov/headlines/y2004/15nov_maya.htm

2. Create a GIS concept map. Using *GIS* as the key word, explore a minimum of 5 threads and nodes and expand on each. Research GIS via the Internet. Ask yourself questions throughout the process. Here are a few to get you started:

• What is GIS? How was it invented; why?

• How does it work?

• How is it different from the traditional map? What advantages/disadvantages does it present?

• What are its various applications?

• What is the relationship between this technology and ecological principles we have studied in class?

• What potential do I see in future applications of this technology? What might be the drawbacks?

Here are a few suggested sites—there are many sites containing fascinating information about GIS. Keep track of websites that contain information you want to cite in your essay.

http://erg.usgs.gov/isb/pubs/gis_poster/ Case studies:
http://www.geo.ed.ac.uk/home/research/whatisgis.html Try out a few demos on the ESRI site:
http://www.esri.com/industries/university/education/demos.html Another interactive site is the Geography Network
http://www.geographynetwork.com/maps/arcexplorerweb.html#usingaeweb

3. Essay. Write a one-page essay persuading the general public that new knowledge and new technologies can be useful in helping humanity create sustainable agro-ecosystems today and in the future. Include three ecological concepts we have covered in class. Cite a minimum of 4 credible sources. Use the attached essay rubric to assist you in assessing your writing. You are encouraged to take advantage of the *NDSU Writing Center*(in the lower level of the Library) in writing/reviewing your essay.

“Concept Mapping” Procedures

"Concept Mapping" (also called mind-mapping or diagramming) is a tool for assisting and enhancing many of the types of higher-level thinking and learning you are required to do in college. Mapping, by its structure, provides opportunity for convergent thinking, fitting ideas together, as well as thinking up new ideas, since it requires all ideas to be connected to one topic and possibly to one another. The examples below are simply a place to start: there is no one right way. However, your map should reflect your engagement with the topic—it should fill the page with connected knowledge and ideas and have a clean, legible presentation.

Example 1 Source: http://www.peterussell.com/MindMaps/HowTo.html

1. Write your topic inside a circle in the middle of a sheet of paper -- it may be a word, a phrase, or a couple of juxtaposed ideas.
2. Draw a number of lines (“threads”) radiating from the circle outwards - about five to begin with. Label each of these threads with a question related to your topic, such as "What is it?" "How does it work?" "Who or what does it affect?" You can also use verbs or words describing relationships (“is responsible for”, “creates”, etc.)

3. As you explore the topic, place generated knowledge, concepts, ideas or answers in circles (“nodes”) at the end of each thread. These nodes then become a cluster with threads of their own, generating more questions and answers. Other suggestions:

• Use color to depict themes, associations and to make things stand out.

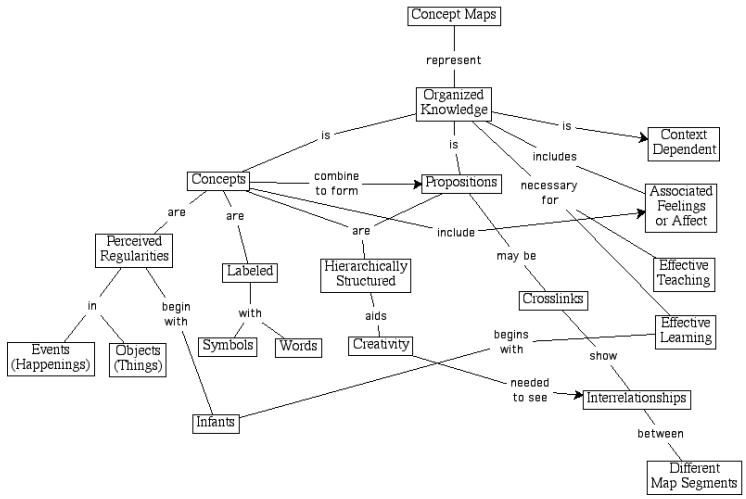
• Anything that stands out on the page will stand out in your mind.

• Think three-dimensionally.

• Use directional arrows, icons or other visual aids to show links between different elements.

• Don't get stuck in one area. If you dry up in one area go to another branch.

Example 2Source: http://www.mindtools.com/pages/article/newISS_01.htm



Advantages of mapping

Here are some advantages of mapping, which will become more apparent to you after you have practiced this technique a few times:

• It clearly defines the central idea, by positioning it in the centre of the page.

• It allows you to indicate clearly the relative importance of each idea.

• It allows you to figure out the links among the key ideas more easily. This is particularly important for creative work such as essay writing.

• It allows you to see all your basic information on one page.

• As a result of the above, and because each Map will look different, it makes recall and review more efficient.

• It allows you to add in new information without messy scratching out or squeezing in.

• It makes it easier for you to see information in different ways, from different viewpoints, because it does not lock it into specific positions.

• It allows you to see complex relationships among ideas, such as self-perpetuating systems with feedback loops, rather than forcing you to fit non-linear relationships to linear formats, before you have finished thinking about them.

• It allows you to see contradictions, paradoxes, and gaps in the material -- or in your own interpretation of it -- more easily, and in this way provides a foundation for questioning, which in turn encourages discovery and creativity

Source*: http://www.coun.uvic.ca/learn/program/hndouts/map_ho.html* Unfortunately, this website is no longer accessible.

Essay Rubric

For assistance with writing/reviewing your essay, contact the NDSU Center for Writers, located in the NDSU Library. Purdue University offers excellent guidance on avoiding plagiarism: http://owl.english.purdue.edu/handouts/research/r_plagiar.html . To read NDSU's policy addressing plagiarism, go to: http://www.ndsu.nodak.edu/policy/335.htm

Evaluation Criteria & Points	Below Standard 1	Approaches Standard 2	Meets Standard 3	Exceeds Standard 4
Mechanics & Grammar	Sentences and paragraphs are difficult to read and understand due to poor grammar or mechanics.	The essay contains numerous grammatical and mechanical errors.	The essay contains minimal grammatical or mechanical errors.	The essay is virtually free of grammatical or mechanical errors.
Thesis & Structure	The essay is unclear due to a lack of thesis and structure.	The main points of the essay are ambiguous. Organization of the essay is a challenge to follow due to inadequate transitions and/or rambling format.	Writing has logical organization and a basic thesis statement; may occasionally drift from the thesis. Basic structure is followed: introduction, main points, transitions, closing.	The essay establishes and maintains a clear focus with ideas developed in depth. Writing follows a seamless structure employing effective transitions and coherent paragraphs.
Evidence & Citations	The essay does not attempt to use evidence to support the thesis. Facts are incorrect or not referenced. Details are random, inappropriate, or barely apparent. Few sources are cited.	The use of evidence is minimal although some of it supports the thesis. Some facts are incorrect. Details lack elaboration or are repetitious. Most sources are cited.	There is evidence to support almost every point. Technical details are generally correct and for the most part are elaborated and appropriate. Details are appropriate. Sources are cited.	Every point is clearly supported by strong evidence. Details are effective, vivid, explicit, and pertinent. All facts are correct, and the technical explanation is both concise and complete. Sources are cited.
Analysis & Critical Thinking	Writing exhibits little understanding of the topic. The essay does not attempt to explain how the evidence relates to the thesis. Student raises no serious objections. Student does not argue logically.	Writing reflects minimal understanding of the topic. The analysis of the evidence lacks consistent relation to the thesis. Objections are weak and responses not developed.	Writing reflects general understanding of the topic. The analysis explains how the evidence supports the thesis in most cases. Implicit objections are raised and responded to.	Writing reflects a clear understanding of the topic. The analysis shows a strong relationship between the evidence and the thesis. Major objections are presented and responded to logically. Insights and ideas are striking, significant and/or illuminating.

Ecological Footprint – Assessment Tool

What Did You Do?

Another assessment tool was implemented during Spring Semester 2010. This assessment tool employed a pre/post ecological footprint assessment in conjunction with a video entitled "*The Ecological Footprint*." The pre-ecological footprint was due on the day of the fourth lecture during the introductory portion of the course. This pre-assessment allowed the students to evaluate their current impact on the environment previous to understanding the ecological concepts presented during the course. The post-ecological footprint was due after all the ecological concepts presented in the course have been discussed and after an informative video entitled "The

Ecological Footprint" is shown in class. Both pre- and post- assessments were reviewed and commented on by the instructor and then returned to the students. This assessment allows the students to evaluate and compare their impact on the planet before and after understanding basic ecological concepts. The change in size of the individual student's "ecological footprint" allowed each student to assess and evaluate their understanding of an application of basic ecological principles.

Objectives Upon completion of this assignment, you will be able to:

• Explain and provide examples of global ecosystem services and terms associated with footprint accounting.

• Provide examples of global initiatives addressing global ecological concerns.

• Analyze your role in the current and potential natural resource issues facing our world.

Instructions This unit examines human impact on, and the threats to services derived from, natural and agro-ecosystems on a global scale. It also explores how humans are addressing these issues from a global perspective. This assignment is worth 2 points and is due at the beginning of class as designated on the syllabus. Late assignments will not be accepted.

Footprint Activity

a. Access the *Global Footprint Network* athttp://www.footprintnetwork.org/index.php

b. Take the *Your Footprint* Quiz. On the global map, click on the United States and select English. Take the entire quiz. Make educated guesses for any questions you are unsure of.

c. Print your results. Complete the following questions. Record your results in the table below. Use the remaining results to answer questions c-e.

Category	**Acres**
Food	
Mobility	
Shelter	
Goods/Services	
Your Total Footprint	

d. Read the following information about the measurement unit of the Footprint. Footprint results are expressed in global acres (or global hectares in metric measurement). Each of those acres corresponds to one acre of biologically productive space with world-average productivity. Today, the biosphere has 26.7 billion acres (or 10.8 billion hectares) of biologically productive space corresponding to less than one-quarter of the planet's surface. These 26.7 billion acres include 5.7 billion acres of productive ocean and 21 billion acres of productive land.

e. Compare your Total Footprint acreage to the average ecological footprint in the United States. Is your footprint larger or smaller? _____

f. Compare your Total Footprint acreage to the biologically productive acres per person worldwide. How many more/less acres are you using? (KEY: Total – 4.5 =)

_____

g. If everyone in the world lived like you, how many planets would we need? _____

h. Take the quiz again. This time, adjust your answers to reflect changes you could make in your lifestyle that would reduce your Total Footprint. List three changes you made:

1_____
2_____
3_____

h. After completing the quiz this second time, how many planets would we need to accommodate a world population living your lifestyle? _____

NRM 150 – Natural Resources Management Undergraduate Orientation – Carolyn Grygiel

The main objective of NRM 150 is to allow new students (1st year, transfer students, and students electing to take a minor) in Natural Resources Management to become acquainted with the various topics of study relating to the management of natural resources.

Student Learning Objectives:

• Observing and participating in an array of lectures presented by guest speakers describing the various aspects and disciplines associated with the management of natural resources

• Recalling and describing various aspects presented by the speakers

• Questioning how these individual lectures applied to and broadened their individual perspective on managing natural resources

• Applying this new knowledge to their personal lifestyle as inhabitants of planet Earth

What Did You Do?

Course Activities: Students attend lectures and take in-class notes on various topics relating to natural resources management presented by NDSU professors and invited guest speakers. A Sequential Course Assessment Tool is employed following each lecture and is the primary assessment tool used in this course. Students are required to complete a "First Survey of Learning" assessment form at the beginning and at the end of the presented lecture material. The first assessment survey is used as a baseline survey the second assessment is used to measure the degree to which the students have increased their knowledge about the environment and their understanding of environmental issues.

Pre-course/post-course "Survey of Learning" Lecture Assessment

1. Briefly define the term: Natural Capital
2. Define the acronym "GNP"; What does this combination of letters describe?
3. What is the most important factor contributing to the global environmental crisis?
4. What is our most economically important natural resource?
5. List three ways humans have affected the natural environment:
6. Most important nutrient for all life forms on planet Earth.
7. What is the approximate current human population on planet Earth?
8. By approximately what percentage does the population in the United States increase each year?
9. What percentage of Americans oppose hunting because they feel it causes animals to suffer?
10. What human practice places the greatest demands on our water resources?

What Did You Learn?

The average score for the pre-course lecture assessment for Fall Semester 2009 was 34%. The average score for the post-course lecture assessment was 94%. The students demonstrated a significantly higher understanding of the material on the post-course lecture assessment. This was the expected response.

Question	Q#1	Q#2	Q#3	Q#4	Q#5	Q#6	Q#7	Q#8	Q#9	Q#10	Mean Score
Pre-	40%	60%	60%	0%	70%	60%	30%	0%	10%	10%	34%
Post-	100%	100%	100 %	100 %	90%	100%	100 %	80%	100 %	70%	94%

What Did You Do?

Sequential Course Assessment Tool. A "Sequential Course Assessment" tool as previously noted was designed and developed for implementation in NRM 150 during Fall Semester 2009. This assessment tool was initially implemented during Fall Semester 2005 and proved so powerful that it was used again during 2006, 2007, 2008, 2009 and will continue to be used in succeeding semesters with updates and modifications as necessary. This assessment tool is comprised of five questions and was presented to the students at the end of each lecture. The students were required to answer all of the questions in a short essay format; the students returned the assessments to the instructor at the next class period. These assessments were reviewed and graded and then returned to the students.

Sequential Course Assessment Questions for NRM 150.

• Briefly describe the content of today's lecture.

• How did this presentation broaden your perspective regarding the environment?

• State at least one new concept you learned during this lecture.

• What did you find most interesting from this lecture?

• From a technical perspective, how would you rate this presentation in terms of visual aids, hand-out materials, public speaking abilities of presenter.

What Did You Learn?

It must be noted that NRM 150 is a Freshman Orientation class that is presented in a seminar format by a series of guest lecturers. The Sequential Course Assessment enables the students to assess not only their understanding of the material presented, but their evaluation of the presenter's skills as a public speaker, power-point show coordinator, and writer of hand-out materials. This is an extremely important "learning tool" in that all of these students will eventually need to make presentations. Application of this tool was successful in that it allowed the students the opportunity for immediate self-assessment of a learning experience. The student's answers were not simply "yes" or "no," but were thoughtful expository responses highly reflective of the lecture's content. This seemingly simple tool generated a profound impact on the student's participation in classroom discussion and discussions among small groups of students when the class session ended. Upon reviewing the assessments, it also allowed the instructor to gather data useful at the next class session for clarifying misunderstood concepts and generating

discussion in response to a student's written query. This sequential course assessment has shown itself to be of great value and will continue to be part of the assessment process for this course.

NRM 491/690 - Natural Resources Management Undergraduate / Graduate Seminar – Carolyn Grygiel

Objectives: To acquaint students with the Harvard Case Study Analysis method for analyzing case studies. Application of the case study method to illustrate how using natural resources for their highest and best uses for society can be fraught with conflicting interests. To illustrate the ecological, geographic, economic, and political complexities associated with the management of natural resources. To provide students with guidance, methodologies, and experience in analyzing contemporary and controversial environmental issues using case studies methods and analyses.

Student Learning Objectives

• Recall and state specific details of specific didactic lectures concerning public speaking presentations, PowerPoint presentations, group dynamics, leadership environmental ethics, etc.

• Develop confidence and skill in public speaking presentations

• Design, develop, and present a case study in accordance with methodologies as presented in lecture

• Design, develop, and present a PowerPoint presentation in accordance with methodologies as presented in lecture

• Present a case study and other speaking presentations in accordance with methodologies as presented in lecture

• Comprehend and apply specific aspects of group dynamics as they have applied to the individual student's life experiences

• Apply various aspects of group dynamics, leadership, and environmental ethics as applicable to the individual student's life experiences

• Apply various aspects of group dynamics, leadership, and environmental ethics as applicable to case studies as presented during class lecture

• Work as a team in the development and synthesizing of a case study presentation on a case study as assigned by the instructor

• Evaluate and critique published findings of a specific case study as assigned by the instructor

What Did You Do?

A pre-course and a post-course assessment of student learning are conducted in this class. The pre-course assessment is presented to the students on the first day of class and the post-course assessment is presented to the students on the last class day preceding the team presentations of case studies.

Pre-Course Assessment

1. We will be discussing several aspects of group dynamics in this seminar. Based upon the following scale, how would you rate your understanding of the listed components of group dynamics.
Scale: Excellent – Very Good – Good – Fair – Poor – Not Sure

Component	Rating
Group Structure	_____
Group Cohesion & Development	_____
Component Rating	_____
Group Conflict	_____
Group Leadership	_____

2. How would you rate your comfort level in the role of a public speaker?
_____Completely at ease
_____A little nervous sometimes
_____Would prefer not to address an audience
_____Would do so only when forced
_____Simply will not speak in front of a group

3. On a scale of 1 – 10, how would you rate your understanding of "ethics" in terms of environmental ethics. _____

4. How many times have you composed a "PowerPoint" presentation? _____

On a scale of 1 – 10 how would you rate your skill level in composing a "PowerPoint" presentation. _____

5. How many times have you composed a professional poster such as one that may be presented at a professional meeting?_____

6. How familiar are you with case study analysis?
_____ Very familiar _____ Somewhat familiar _____ Used it a few times in other classes
_____ Unfamiliar _____ Never heard of case study analysis

7. Provide a list of what you expect to learn in this class

- _____
- _____
- _____
- _____
- _____

8. Provide a list of three people who have inspired you in terms of their leadership abilities.

- _____
- _____
- _____

Post-Course Assessment

1. We discussed several aspects of group dynamics in this seminar. Based upon the following scale, how would you rate your understanding of the listed components of group dynamics.

Scale: Excellent – Very Good – Good – Fair – Poor – Not Sure

Component	Rating
Group Structure	_____
Group Cohesion & Development	_____
Component Rating	_____
Group Conflict	_____
Group Leadership	_____

2. How do you think your comfort-level in the role of a public speaker has been enhanced by the material presented in class concerning "The Art of Scientific Presentation" and "The Art of PowerPoint"? Are you now: _____ Completely at ease
_____ More at ease than previously
_____ A little nervous sometimes
_____ Would prefer not to address an audience
_____ Would do so only when forced
_____ Simply will not speak in front of a group

3. On a scale of 1 – 10, how would you rate your understanding of "ethics" in terms of environmental ethics.
4. On a scale of 1 – 10 how would you rate your skill level in composing a "PowerPoint" presentation. _____
5. How familiar are you with case study analysis?
_____ Very familiar
_____ Somewhat familiar
_____ Used it a few times in other classes
_____ Unfamiliar
_____ Never heard of case study analysis

What Did You Learn?

The questions scored in these assessments were questions 1 - 5 on the pre-course assessment and questions 1 - 5 on the post-course assessment. Analyses of the pre-course and post-course assessment are shown on the following Table below.

Assessment Components	Average Pre-Course Assessment	Average Post Course Assessment
Understanding of Group Dynamics	Fair to Good understanding	Very good understanding
Comfort Level in the Role of a Public Speaker	A little nervous sometimes	Much more at ease than previously
Understanding of Environmental Ethics	Scale of (1 – 10) Average Score = 6.4	Scale of (1 – 10) Average Score =7.8
"PowerPoint" Skill Level Rating	Scale of (1 - 10) Average Score =6.8	Scale of (1 – 10) Average Score = 8.1
Familiarity with Case Study Analysis	Used a few times in other class	Very familiar

What Did You Do?

A “Sequential Course Assessment” tool was designed and developed for implementation in NRM 491/690 during Spring Semester 2008. This assessment tool was deemed a “PR-6” and was used for the first time for the 2008 semester. The PR-6 has proven so powerful that it will continue to be used in succeeding semesters with updates and modifications as necessary. This assessment tool was successfully used for Spring Semester 2010. This assessment tool is comprised of six questions for undergraduate students and seven questions for graduate students. The students were required to answer all of the questions in a short essay format; the students returned the assessments to the instructor at the next class period. These assessments were reviewed and graded by the instructor and then returned to the students.

1. One paragraph briefly describing the content of the presentation.

2. One paragraph describing how the presentation broadened your perspective on the subject.

3. List three new concepts you learned from this presentation.

4. A statement indicating what you found most interesting about this presentation.

5. A statement describing what you learned from the technical perspective of giving a presentation.

6. Additional comments, if any.

7. (Graduate Students) Please state a question for discussion you will present to your undergraduate team members.

It must be noted that NRM 491/690 is a graduate/undergraduate seminar where the class is divided into teams of four or five students with a graduate student serving as a team leader. The PR-6s are required of all ten didactic lectures which cover various topics including group dynamics, presentation skills, PowerPoint skills, leadership, etc. This enables the students to assess not only their understanding of the material presented, but their evaluation of the presenter’s skills as a public speaker, power-point show coordinator, and writer of hand-out materials. The instructor serves as a role model for demonstrating the skills the students should garner from this course.

<u>What Did You Learn?</u>

Application of this tool was successful in that it allowed the students an opportunity for immediate self-assessment of a learning experience. The student’s answers were not simply “yes” or “no,” but were thoughtful expository responses highly reflective of the lecture’s content. This seemingly simple tool generated a profound impact on the student’s participation in classroom discussion and discussions among small groups of students when the class session ended. Upon reviewing the assessments, it also allowed the instructor to gather data useful at the next class session for clarifying misunderstood concepts and generating discussion in response to a student’s written query. This sequential course assessment has shown itself to be of great value and will continue to be part of the assessment process for this course.

NRM 432/632 – Environmental Impact Statements – Carolyn Grygiel, Instructor of Record; Christina Hargiss, Course Instructor

Course Objectives: To provide students with an in depth review of EIS's (Environmental Impact Statements) including instruction and preparation of an EIS. To acquaint students with a "check list system" for evaluating the validity of an EIS and to provide the students guidance in evaluating their own attempts at writing an EIS.

What Did You Do?

A pre-course and a post-course assessment of student learning are conducted in this class. The pre-course assessment is presented to the students on the first day of class and the post-course assessment is presented to the students near the end of the semester. Fall Semester 2009 enrolled 47students (17 undergraduate and 30 graduate). The majority of students (85%) were from the Natural Resources Management Program major. Spring Semester 2010 enrolled 35 students (27 undergraduate and 8 graduate). The majority of the students (80 %) were from the Natural Resources Management Program.

What Did You Learn?

For Fall Semester 2009, the pre-course assessment average was 12% for undergraduate students and 23% for graduate students. The post-course assessment was 90% for undergraduate students and 95% for graduate students. For Spring Semester 2010, the pre-course assessment average was 8% for undergraduate students and 13% for graduate students. The post-course assessment was 88% for undergraduate students and 93% for graduate students. The same questions were asked on both examinations and the students clearly demonstrated an increase in knowledge by significantly increasing their scores on the post-course assessment as compared with the pre-course assessment. This was the expected result.

Pre-Course and Post-Course Assessment Questions

1. What is the basis of federal planning?
2. What is NEPA?
3. What year was NEPA enacted?
4. What is the role of the Environmental Protection Agency?
5. What is the role of the Council on Environmental Quality?
6. In the NEPA context, what is a "proposed action?"
7. Define Categorical Exclusions and Environmental Assessments.
8. Define Environmental Impact Statements.
9. What is a Management Action Plan?
10. What is a Notice of Intent?
11. How is the purpose and need of an EIS developed?
12. Define "Affected Environment" as it pertains to NEPA?
13. What are cumulative impacts?
14. What is post monitoring and mitigation?
15. What is the "Rule of Reason and Sliding Scale approach?"
16. What is a NOI?
17. What are the state's rights/responsibilities in Federal planning?
18. Can an agency's decision be challenged? If so, how?
19. What is Total Federal Planning?
20. Why is NEPA limited to federal actions; do you agree with the Congressional decision?

NRM 453/RNG 453 – Rangeland Resources Watershed Management – Jack Norland

What Did You Do?

The assessment for NRM 453 / NRM 453 consisted of 20 questions taken from various internet based quizzes generated by government agencies concerned with watersheds and water quality management. The questions are designed to reflect what a well-educated individual should know about watershed management. This assessment assess not only what should have been learned in class, but what educators believe should be known by professionals who manage watersheds.

What Did You Learn?

Assessment Results – Spring Semester 2010

Pre-course assessment results	53%
Post-course assessment results	93%

Pre-course and post course assessment questions:

1. Question A watershed is generally defined as:
A. a building that stores water
B. all the land area that drains to a given point in a water body
C. all the water that drains to a given point in a landform
D. a moment in time when you cross into a new area

2. Question Percentage of Americans who can correctly answer the previous question, according to national surveys.
A. every red-blooded American
B. 20%
C. 41 %
D. 0%, and we shouldn't discuss this subject.

3. Question Stream order is a technique to:
A. stop stream disturbance by issuing regulatory permits
B. classify streams based on their location in the drainage network
C. prevent flow from running downhill

4. Question How much land in a watershed would be taken up by a stream buffer network that extends a distance of 100 feet from either side of the stream?
A. 15%
B. 25%
C. 0%
D. 5% - 39 -

5. Question Recent watershed research has discovered that urban stream quality begins to decline sharply once impervious cover in a watershed exceeds:
A. 10%
B. 25%
C. 40%
D. 75%

6. Question _____ vegetation is characteristic of wetland environments.
A. hydrostatic
B. hydrologic
C. hydrophobic
D. hydrophytic

7. Question Most precipitation enters streams.
A. True
B. False

8. Question Which of the following comprises the greatest percentage of impervious cover in suburban areas?
A. rooftops
B. lawns
C. roads, driveways, parking lots
D. vacant lots

9. Question Which is best watershed management unit for conducting local watershed management plans?
A. watershed
B. basin
C. subwatershed
D. catchment

10. Question Which is the largest watershed management unit?
A. basin
B. watershed
C. catchment
D. subwatershed

11. Question When a first order stream flows into another first order stream, the resulting stream order is:
A. first order
B. second order
C. third order
D. back ordered

12. Question First and second order streams comprise what percent of the total stream and river mileage of the United States?
A. 20%
B. 40%
C. 67%
D. 100% - 40 –

13. Question How much more storm water runoff is produced by a one acre parking lot compared to a one acre meadow?
A. 75%
B. no difference
C. 200%
D. 1600%

14. Question Which class of organism can survive with lower D.O.
A. Warm water fish
B. Cold water fish
C. pouch snails

15. Question Organisms that live in or close to the bottoms of streams are?
A. benthic
B. littoral
C. riparian
D. hydrophytic

16. Question What is a BACI monitoring system ?
A. poor monitoring system
B. monitors only riparian areas
C. monitors before impact, after impact, at a control and an impact site
D. monitors the stream geomorphology

17. Question What is a TMDL?
A. Monitoring system for stream geomorphology
B. method to set pollution standards
C. a stream restoration technique
D. technology to prevent erosion of agricultural fields

18. Question Manure provides what nutrient at higher levels than what plants need.
A. nitrogen
B. phosphorus
C. potassium
D. iron

19. Question Stream restorations should be inspected after what kind of stream event?
A. a low water event
B. during a channel forming discharge event
C. after a peak flow event from a typical summer thunderstorm
D. during average discharge events

20. Question Which vegetation is most effective in trapping sediment?
A. trees with complete canopy coverage
B. mowed lawn
C. Kentucky Bluegrass
D. tall grass

NRM 701 – Terrestrial Resources Management Instructor: Dr. Jack Norland

Course Objectives: At the end of this course, the student will be able to:

• Identify and explain the different management perspectives that pertain to the various social-ecological systems and natural resources management fields.

• Compare and contrast the tools and skills needed for management of terrestrial social-ecological systems.

• Critically integrate and apply the different management perspectives that pertain to various social-ecological systems and natural resources management fields.

• Evaluate current terrestrial management efforts.

• Prepare analyses of a real-world natural resources management problems using the various perspectives.

• Communicate the different perspectives and their application to various social-ecological systems to peers, faculty, and other interested individuals.

What Did You Do?

A pre and post assessment for the NRM 701 Terrestrial Resources Management class was conducted for Spring Semester 2010. The assessment consisted of an essay question posed to the students at the beginning of the semester and at the end. The question was designed to evaluate the educational achievement of the individual students in relation to the different perspectives in managing natural resources. The question posed to the students at the beginning and end of the semester was "Contrast the differences between the steady-state perspective and the resilience perspective when managing social-ecological systems." The students were given 30 minutes to answer the question and were not allowed any outside resources.

What Did You Learn?

Results of the assessment were that at the beginning of the semester the students were able to identify the steady-state perspective used in natural resources management, but were unable to compare how that perspective was different from the resilience perspective. The students were able to give vague definitions of the resilience perspective, but did not understand how it was different from the steady-state perspective. By the end of the semester the students were able to contrast the two different perspectives. They were able to give a detailed explanation of the resilience perspective and its ability to deal with varying levels of stress and uncertainty which is in contrast to the steady-state perspective of variance reduction and inability to deal with uncertainty. The students understood how the steady-state perspective had no adaptability to deal with differing system states and directional change while the resilience perspective emphasizes adaptability and has the capacity to deal with directional change. This is evidence to me that students are not only grasping the content, but also genuinely interested in the course material. Overall, students' abilities to retrieve and summarize data, to integrate and apply concepts, and to critically evaluate information was evident from the improvement from the pre course assessment to the post course assessment.

RNG 450/650 – Range Plants – E. Shawn DeKeyser

What Did You Do?

The primary method utilized to evaluate both graduate and undergraduate students in this class is through identification of unknown plant species by family/tribe, genus, and specific epithet with pressed herbarium mounts. This has been shown to be the optimum method for this type of course. Additional information the students are tested on included the life span, origin, longevity, season, and forage value of each species identified. Another method used to evaluate the overall success of the students comprehending the information of the course is the pre- and post-test method. A set of 10 plant species was selected and the students were tested the first day of class. They were asked to identify the 10 species by family/tribe, genus, and specific epithet; and asked to give the longevity and origin of each species. Similarly, there was a post test given at the end of the course and the results are compared. Additional to the regular exams and the pre and post tests, graduate students were required to write a four page research paper on one of the plant species covered during the course. The paper had to cover distinguishing morphological characteristics, life span, origin,

longevity, season, habitat, and forage value. The paper also had to cover some ecological aspect of the species of concentration.

What Did You Learn?

The pre-test had an average of 5% for undergraduates and 6% for graduates. The post-test had an average of 85% for undergraduates and 100% for graduates. Individual results are as follows:

Undergraduate	Pre Exam	Post Exam	Graduate	Pre Exam	Post Exam
	13	92		0	100
	0	100		10	100
	0	100		23	100
	6	80		0	99
	5	100		0	100
	0	0		2	100
	10	93		9	99
	4	97	Average	6.3	99.7
	8	99			
Average	5.1	84.6			

Overall, the improvement in the pre- and post-tests were very good. It should be taken into consideration that the one 0 for the post exam is of a student who stopped coming for the last 1/3 of class. If that 0 were removed the overall undergraduate score would be 95% for the post exam average. Most of what was learned towards the improvement of the class was obtained through the regular exams.

What Will You Do Differently As a Result of What You Learned?

There still has to be more concentration placed on the distinguishing characteristics between similar species.

Create PowerPoint presentations on habitat characteristics of the individual species.

Bring in new equipment such as lighted magnifiers to aid the students in identifying characteristics.

RNG 452 - Geographic Information Systems in Range Survey – Mario Biondini

What Did You Do?

I used two tools to assess student learning:

The first tool consisted of testing the students at the beginning and end of the course regarding their understanding of 8 key areas

Question 1: Understanding how Geographic Information Systems (GIS) are used in range survey and natural resource management.

Question 2: Knowledge about the difference between projected vs. geographic coordinate systems.

Question 3: Knowledge about the differences and uses of raster vs. vector databases.

Question 4: Knowledge about geodatabases and their uses.

Question 5: Knowledge about how to create spatial data set bases using proximity, overlays, and attributes methods.

Question 6: Familiarity with spatial analysis based on raster data processing.

Question 7: Knowledge regarding the design and implementation of field random sampling protocols

Question 8: Knowledge regarding the design and implementation of field cluster, stratified, and double sampling protocols.

The second tool was the "***fact sheet***" exercise. At the end of lectures and exercises associated with a selected set of textbook chapters the students were asked a series of simple questions about the material covered (***see attached example***). The purpose of this exercise was to measure how much the students have understood and retained regarding the subject addressed in the chapter.

What Did You Learn?

1. Before and after assessment question.

Table 1. Results from the before and after course test. The question as described in the previous section

	Percentage of each grade							
	%A		%B		%C		%D	
	Before	After	Before	After	Before	After	Before	After
Question 1	0	18	35	82	60	0	5	0
Question 2	0	18	25	82	40	0	35	0
Question 3	0	27	10	73	35	0	55	0
Question 4	0	55	30	45	25	0	45	0
Question 5	0	36	15	64	40	0	45	0
Question 6	5	45	15	55	30	0	50	0
Question 7	0	45	10	55	20	0	70	0
Question 8	0	45	5	55	25	0	70	0

Table 2. Average grade before and after course test.		
	Average grade before course	Average grade after course
Question 1	2.30	3.18
Question 2	1.90	3.18
Question 3	1.55	3.27
Question 4	1.85	3.55
Question 5	1.70	3.36
Question 6	1.75	3.45
Question 7	1.40	3.45
Question 8	1.35	3.45

2. Fact sheet results

Table 3. Results from the fact sheet evaluation of selected chapters	
	Average grade in a 0-100 scale (± 95 CI)
Chapter 1 fact sheet	83 ± 7.8
Chapter 2 fact sheet	77 ± 14.2
Chapter 5 fact sheet	87 ± 7.9
Chapter 7 fact sheet	90 ± 3.7
Chapter 8 fact sheet	81 ± 5.7

What Will You Do Differently As a Result of What you Learned?

In the before and after set of tests that were designed to specifically cover broad elements of understanding about GIS and experimental design the students went from an average D to a B. Furthermore, in the after assessment all grades were either A or B which represents a substantial improvement.

The change in the before and after test can be largely explained by the results from the fact sheet assessments. These assessments were designed to ascertain the level of details understanding that the students were acquiring from the lectures and associated exercises. The overall result was an average B indicating good level of retention. That retention was substantially facilitated by the in-class exercises for each of the topics covered. From previous assessments I learned that GIS lectures by themselves are not very useful if there are not immediately followed by exercises. Thus, starting in the Fall of 2007 I divided the 1:20 minute class (all conducted in a computer cluster) into a 30 minute lecture followed with a 90 minute “hands on” computer exercise on the topic covered by the lecture.

The major change I will implement in the Fall of 2011 will to: (a) require that every student come to class with a laptop computer with the hardware necessary to run ArcGIS (as

specified by ITS); and (b) require that every student either own the ArcGIS software or gets a one semester ArcGIS license (available from ITS). The reason for this requirement is that enrollment in both RNG 452 and 652 has increased so much that students cannot be accommodated any longer in our average size cluster. In the Fall of 2009 I had to allocate 3 students per computer. With the laptop and software requirements I will be able to teach the course in a regular class.

Given the number of students enrolled and both RNG 452 and 652 and the computer intensive nature of the course I will need in the future a TA for this class. Last Fall I had to break the flow of the class too many times to solve standard computer glitches and/or help students that have fallen behind. In the review of the course students pointed out that the process was not helpful (in fact it was annoying for students that were doing OK).

Name_____

RNG 452
Fall 2009
Due: _____
Date turned in: _____

Geographic Information Systems in Range Survey

Chapter 1: Explore Geographic Data with ArcCatalog

Part I:

Read Chapter 1 Overview.

Part II:

Enter your answers in the attached form. SAVE THE FILE IN MS WORD WITH YOUR NAME IN IT. FOR EXAMPLE: Joe Doe Assignment 1

###

Copy over your answers from Introducing GIS with ArcGIS, Chapter 1.

Exercise 1-4 (Project)
Looking at the ArcCatalog Program

{__20} In the Catalog Tree click on the ___:\ RNG 452 (*or the folder where you put the files*) designation. Write here what the Status Bar indicates: _____ Find the following entries, write the Status Bar text string, replicate the appearance of the associated icon by drawing it next to the text string, and, finally, expand the entry.

Village Data _____

HYDRANTS_____

Point _____

River_____

Boat_SP83.shp _____

COLE_DRG.tif _____

COLE_DOQ64.jpg _____

COLE_TIN _____

Wildcat_Boat_Data _____

Wildcat_Boat_Data.mdb _____

Area_Features _____

Soils _____

Exercise 1-5 (Major Project)
Exploring Data with ArcCatalog -- Fire Hydrants in a Village

{__9} What is it? _____ What is the FLOW_RATE of the Hydrant? _____ What are the geographic coordinates of the hydrant? _____ _____

{__11} What is the average Y-coordinate? _____

{__15} How many records are there with the text string “Red”? _____? _____

{__17} How many instances do you find? _____

{__21} Write here the description of the tool that you see on the Status Bar. _____.

{__24} Roughly (to the nearest tenth of a foot), what are the coordinates of the lower left-hand corner of the window? _____,_____ How about the upper-right hand corner? _____,_____

{__31} Using the attribute table, determine the x and y coordinates of tic number 3? _____,_____

{__33} What is the size of the data set? _____ MB

{__34} What is the westernmost bounding coordinate? (hint look at projected coordinates in the Spatial tab of Metadata) _____

{__35} What is the Data type of the FLOW_RATE? INTEGER. What is the Output width of X-COORD? _____.

Exercise 1-6 (Project)
A Look at Some Spatial Data for Finding a Site for the Wildcat Boat Facility

{__8} What is the Type of the entry? _____? What is the Projection of the data? _____

{__9} How many soils polygons are there? _____

{_10} To the nearest tenth of a meter, what is the perimeter of the polygon with the smallest area? _____ meters

{__11}
Projected coordinate system name _____

Geographic coordinate system name _____

Westmost bound: Geographic _____ Projected: _____

Eastmost bound: Geographic _____ Projected: _____

Northmost bound: Geographic _____ Projected: _____

Southmost bound: Geographic _____ Projected: _____

False easting: _____

False northing: _____

{__14} What is the FID number of the first record? _____. What is the number of the last record? _____. How many records (and, hence, how many landcover polygons) are there? _____ Sort the records. What is the area of the smallest polygon (record all digits) _____ square meters.

{__15}
Projected coordinate system name _____

Geographic coordinate system name _____

Westmost bound: Geographic _____XXX_____ Projected: _____

Eastmost bound: Geographic _____ XXX _____ Projected: _____

Northmost bound: Geographic _____ XXX ____ Projected: _____

Southmost bound: Geographic ____ XXX _____ Projected: _____

{__17} Do they have the same coordinates systems? _____

{__19} How many land cover polygons are there? _____

{__20} What is the perimeter of the polygon with the largest *land* area (to the nearest meter)? _____ meters. What is the area of the smallest polygon (record all digits)? _____ square meters.

{__21} Find the Landcover feature class attributes and their properties with a right-click the Landcover icon. Then select Properties > Fields. Fill out the following table, except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__24} Click the large polygon in the north-east (That's water—note the SUITABILITY and the SOIL_CODE: _____, _____).

{__25} What is the smallest area? _____ The largest? _____. What is the area of the largest polygon that is not water? _____

{__26} Find the Soils attributes and their properties with a right-click Soils.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__29} What is its projection? _____

{__30} Date _____ Time _____

{__31} What is the geographical coordinate system name? _____ What is the projected coordinate system name? _____ To the nearest hundredth of a degree, what are the geographic coordinates of the northwest corner? _____, _____ The southeast corner? _____, _____.

{__32} In the projected coordinates, to the nearest meter, what are the coordinates of the northwest corner? _____, _____ The southeast corner? _____,_____ What are the units of Roads? _____

{__34} What is the length of the road to the nearest meter? _____. What is the OBJECTID of this road? _____. The road code for this arc is _____.

{__35} Fill out the table below except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__37} How many arcs are there?_____ What are the diameters of the various sewer pipes (inches)? _____, _____

{__38} Fill out the table below except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__40} What is the total length in **kilometers** of all the streams in the study area? _____ What is the longest stream segment in **meters**? _____

{__41} Fill out the table below except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__50} What are the columns in Attributes Of LC_Code&Type?

_____, _____, _____

{__53} Open the attribute table of the Landcover layer. Notice that all the information has been put together. Sort the Landcover type. How may polygons consist of barren land? _____

RNG 652 - Geographic Information Systems in Range Survey – Mario Biondini

What Did You Do?

I used two tools to assess student learning. The first tool consisted of testing the students at the beginning and end of the course regarding their understanding of 8 key areas

Question 1: Understanding how Geographic Information Systems (GIS) are used in range survey and natural resource management.

Question 2: Knowledge about the difference between projected vs. geographic coordinate systems.

Question 3: Knowledge about the differences and uses of raster vs. vector databases.

Question 4: Knowledge about geodatabases and their uses.

Question 5: Knowledge about how to create spatial data sets bases using proximity, overlays, and attributes methods.

Question 6: Familiarity with spatial analysis based on raster data processing.

Question 7: Knowledge regarding the design and implementation of field random sampling protocols

Question 8: Knowledge regarding the design and implementation of field cluster, stratified, and double sampling protocols.

The second tool was the "***fact sheet***" exercise. At the end of lectures and exercises associated with a selected set of textbook chapters the students were asked a series of simple questions about the material covered (***see attached example***). The purpose of this exercise was to measure how much the student have understood and retained regarding the subject addressed in the chapter.

What Did You Learn?

Before and after assessment question.

Table 1. Results from the before and after course test. The question as described in the previous section

	Percentage of each grade							
	%A		%B		%C		%D	
	Before	After	Before	After	Before	After	Before	After
Question 1	13	56	74	44	13	0	0	0
Question 2	13	44	12	56	50	0	25	0
Question 3	13	67	24	33	38	0	25	0
Question 4	0	67	37	33	63	0	0	0
Question 5	0	44	49	56	50	0	0	0
Question 6	0	67	37	33	50	0	13	0
Question 7	0	78	37	22	38	0	25	0
Question 8	0	67	37	33	50	0	13	0

Table 2. Average grade before and after course test.		
	Average grade before course	Average grade after course
Question 1	3.00	3.56
Question 2	2.13	3.44
Question 3	2.25	3.67
Question 4	2.37	3.67
Question 5	2.47	3.44
Question 6	2.24	3.67
Question 7	2.12	3.78
Question 8	2.24	3.67

2. Fact sheet results

Table 3. Results from the fact sheet evaluation of selected chapters	
	Average grade in a 0-100 scale (± 95 CI)
Chapter 1 fact sheet	91 ± 1.5
Chapter 2 fact sheet	97 ± 2.3
Chapter 5 fact sheet	97 ± 2.6
Chapter 7 fact sheet	97 ± 1.4
Chapter 8 fact sheet	95 ± 1.7

What Will You Do Differently as a Result of What You Learned?

In the before and after set of tests that were designed to cover broad elements of understanding about GIS and experimental design the students went from an average C to a B. Furthermore, in the after assessment all grades were either A or B which represents a good improvement.

The change in the before and after test can be largely explained by the results from the fact sheet assessments. These assessments were designed to ascertain the level of details understanding that the students were acquiring from the lectures and associated exercises. The overall result was an average A indicating excellent level of retention. That retention was substantially facilitated by the in-class exercises for each of the topics covered. From previous assessments I learned that GIS lectures by themselves are not very useful if there are not immediately followed by exercises. Thus, starting in the Fall of 2007 I divided the 1:20 minute class (all conducted in a computer cluster) into a 30 minute lecture followed with a 90 minute “hands on” computer exercise on the topic covered by the lecture.

The major change I will implement in the Fall of 2011 will be to: (a) require that every student come to class with a laptop computer with the hardware necessary to run ArcGIS (as specified by ITS); and (b) require that every student either own the ArcGIS software or gets a one-semester ArcGIS license (available from ITS). The reason for this requirement is that enrollment in both RNG 452 and 652 has increased so much that students cannot be

accommodated any longer in our average size cluster. In the Fall of 2009 I had to allocate 3 students per computer. With the laptop and software requirements I will be able to teach the course in a regular class.

Given the number of students enrolled in both RNG 452 and 652 and the computer intensive nature of the course, I will need in the future a TA for this class. Last Fall I had to break the flow of the class too many times to solve standard computer glitches and/or help students that have fallen behind. In the review of the course students pointed out that the process was not helpful (in fact it was annoying for students that were doing OK).

Name_____

RNG 652
Fall 2009
Due: _____
Date turned in: _____

*ˇ1ÆŠ°ø ª Ł˝#ı–1ßæ °–Ł1#Ê¹–ˇæ ¹#1#° 1Æˇ#°ßÓˇÊ#

Chapter 1: Explore Geographic Data with ArcCatalog

Part I:

Read Chapter 1 Overview.

Part II:

Enter your answers in the attached form. SAVE THE FILE IN MS WORD WITH YOUR NAME IN IT. FOR EXAMPLE: Joe Doe Assignment 1

###

Copy over your answers from Introducing GIS with ArcGIS, Chapter 1.

Exercise 1-4 (Project)
Looking at the ArcCatalog Program

{__20} In the Catalog Tree click on the ___:\ RNG 652 (*or the folder where you put the files*) designation. Write here what the Status Bar indicates: _____ Find the following entries, write the Status Bar text string, replicate the appearance of the associated icon by drawing it next to the text string, and, finally, expand the entry.

Village Data _____

HYDRANTS_____

Point _____

River_____

Boat_SP83.shp _____

COLE_DRG.tif _____

COLE_DOQ64.jpg _____

COLE_TIN _____

Wildcat_Boat_Data _____

Wildcat_Boat_Data.mdb _____

Area_Features _____

Soils _____

Exercise 1-5 (Major Project)
Exploring Data with ArcCatalog -- Fire Hydrants in a Village

{__9} What is it? _____ What is the FLOW_RATE of the Hydrant? _____ What are the geographic coordinates of the hydrant? _____ _____

{__11} What is the average Y-coordinate? _____

{__15} How many records are there with the text string "Red"? _____? _____

{__17} How many instances do you find? _____

{__21} Write here the description of the tool that you see on the Status Bar. _____.

{__24} Roughly (to the nearest tenth of a foot), what are the coordinates of the lower left-hand corner of the window? _____,_____ How about the upper-right hand corner? _____,_____

{__31} Using the attribute table, determine the x and y coordinates of tic number 3? _____,_____

{__33} What is the size of the data set? _____ MB

{__34} What is the westernmost bounding coordinate? (hint look at projected coordinates in the Spatial tab of Metadata) _____

{__35} What is the Data type of the FLOW_RATE? INTEGER. What is the Output width of X-COORD? _____.

Exercise 1-6 (Project)
A Look at Some Spatial Data for Finding a Site for the Wildcat Boat Facility

{__8} What is the Type of the entry? _____? What is the Projection of the data? _____

{__9} How many soils polygons are there? _____

{_10} To the nearest tenth of a meter, what is the perimeter of the polygon with the smallest area? _____ meters

{__11}
Projected coordinate system name _____

Geographic coordinate system name _____

Westmost bound: Geographic _____ Projected: _____

Eastmost bound: Geographic _____ Projected: _____

Northmost bound: Geographic _____ Projected: _____

Southmost bound: Geographic _____ Projected: _____

False easting: _____

False northing: _____

{__14} What is the FID number of the first record? _____. What is the number of the last record? _____. How many records (and, hence, how many landcover polygons) are there? _____ Sort the records. What is the area of the smallest polygon (record all digits) _____ square meters.

{__15}
Projected coordinate system name _____

Geographic coordinate system name _____

Westmost bound: Geographic _____XXX_____ Projected: _____

Eastmost bound: Geographic _____ XXX _____ Projected: _____

Northmost bound: Geographic _____ XXX ____ Projected: _____

Southmost bound: Geographic ____ XXX _____ Projected: _____

{__17} Do they have the same coordinates systems? _____

{__19} How many land cover polygons are there? _____

{__20} What is the perimeter of the polygon with the largest *land* area (to the nearest meter)? _____ meters. What is the area of the smallest polygon (record all digits)? _____ square meters.

{__21} Find the Landcover feature class attributes and their properties with a right-click the Landcover icon. Then select Properties > Fields. Fill out the following table, except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__24} Click the large polygon in the north-east (That's water—note the SUITABILITY and the SOIL_CODE: _____, _____).

{__25} What is the smallest area? _____ The largest? _____. What is the area of the largest polygon that is not water? _____

{__26} Find the Soils attributes and their properties with a right-click Soils.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__29} What is its projection? _____

{__30} Date _____ Time _____

{__31} What is the geographical coordinate system name? _____ What is the projected coordinate system name? _____ To the nearest hundredth of a degree, what are the geographic coordinates of the northwest corner? _____, _____ The southeast corner? _____, _____.

{__32} In the projected coordinates, to the nearest meter, what are the coordinates of the northwest corner? _____, _____ The southeast corner? _____,_____ What are the units of Roads? _____

{__34} What is the length of the road to the nearest meter? _____. What is the OBJECTID of this road? _____. The road code for this arc is _____.

{__35} Fill out the table below except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__37} How many arcs are there?_____ What are the diameters of the various sewer pipes (inches)? _____, _____

{__38} Fill out the table below except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__40} What is the total length in **kilometers** of all the streams in the study area? _____ What is the longest stream segment in **meters**? _____

{__41} Fill out the table below except for Width.

Field Name	Data Type	Width
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

{__50} What are the columns in Attributes Of LC_Code&Type?

_____, _____, _____

{__53} Open the attribute table of the Landcover layer. Notice that all the information has been put together. Sort the Landcover type. How may polygons consist of barren land? _____

RNG 462/662 - Rangeland Planning and Analysis – E. Shawn DeKeyser

What Did You Do?

This is the new capstone course for the Range Program, and the first time this course was taught. The main form of assessment was the development of a final Ranch Management plan, both in written format and part of a formal presentation. The plans were developed in teams working as professional consulting groups. Other forms of assessment during the class included: attendance, class participation, professionalism, class presentations, team work ability, contemplative writing, and small assignments.

What Did You Learn?

There is a need from the students of a more detailed structure of the course. The structure required can only go insofar as to direct them towards the expected goals met for the next assignment, and not what the instructor wants for an answer on the assignment. Increase classroom discussions and classroom group meetings. Formalize group meetings with required note taking and review of past notes with goals reviewed. Teams need to have at least 7-10 people, 5 people or less is too much of a burden for what is required of developing a plan.

What Will You Do Differently as a Result of What You Learned?

More structure on assignment requirements.
Development of larger teams.
Professionalize group meetings.

RNG 765 - Analysis of Ecosystems – Mario Biondini

What Did You Do?

Students were tested at the beginning and end of the course regarding their understanding of 10 areas covered in the course:

1. Understanding of eigenvalue in the context of ordination.

2. What is the so called “dust bunny” distribution problem in ordination.

3. What is a “Gleason” unit

4. Understanding the so called “four corner problem” in ecological analysis.

5. Understanding the “horse shoe” problem in ordination.

6. Knowledge regarding correspondence analysis.

7. Knowledge regarding canonical correspondence analysis.

8. Knowledge regarding the Dufrene and Legendre analysis method.

9. With what method is the problem of space conserving vs. space non-conserving strategies is primarily associated with.

10. Knowledge regarding MRPP and MRBP procedures

What Did You Learn?

Knowledge Area	% of Students with Correct Answers at the Beginning of the Semester	% of Students with Correct Answers at the End of the Semester
1	0	54.5
2	7.7	36.4
3	7.7	72.7
4	7.7	45.5
5	15.4	90.9
6	7.7	81.8
7	0	72.7
8	7.7	36.4
9	0	45.5
10	7.7	27.3

Summary:

At the beginning of the semester at least 92% of the students *had little knowledge* of 9 or the 10 subject areas covered in the course.

At the end of the semester the knowledge level increased significantly: 70% or more of the students were *knowledgeable* in 4 of the 10 areas evaluated at the beginning of the course, while an average of 41% where *knowledgeable* in the other 6 areas.

What I learned was that students developed excellent skills in solving actual empirical problems, but had some difficulties in understanding and conceptualizing both the rational and the theoretical bases of the statistical methods covered in the course. That was reflected in high grades in the seven assignments that I used for grading, but low levels of theoretical understanding in three of the most difficult areas: (1) The problems associated with double zeros in the species data space; (2) the Dufrene and Legendre analysis method for indicator species; and (3) theoretical knowledge of the foundations of MRPP and MRBP. I also learned that there were the same problems that I encountered the last time I taught the

course. In an attempt to improve on the issue, this time I added more extensive class discussions on this theoretical foundation of various topics, but apparently it was not enough.

What Will You Do Differently as a Result of What You Learned?

Next time I will add student presentations as a vehicle to encourage a more detailed discussion regarding the theoretical foundations of all the areas covered in the class.

Another change I will implement in the Spring of 2012 will be to: (a) require that every student come to class with a laptop computer with the hardware necessary to run PC-Ord version 5 or higher (as specified by ITS); and (b) require that every student buy the student version of PC-Ord version 5 or higher. The reason for this requirement is that: (a) given the increases in enrollment the School of NRS can no longer afford to buy the necessary licenses and upgrades of PC-Ord; (b) it is becoming difficult to accommodate the students in our average size cluster; and (c) with the present system, students are tied up to using the clusters for assignments, which for many of them, with field seasons underway at the end of the semester, it is an increasing inconvenience.

Soil 210 – Introduction to Soil Soil Science - R. Jay Goos

What Did You Do?

Since the course is taught both semesters, by the same instructor with the same content, assessment was only done in the Spring Semester 2010. A pretest was given at the beginning of the semester, and the same ten questions included on the final exam. The pretest was given online via Blackboard. The pretest follows. The correct answers are in italics.

1. Soils derived from residuum would most likely be found:
   in southwestern North Dakota.
   in central North Dakota.
   around Fargo.
   in northern Minnesota.
   in a bog in Ontario.

2. The A horizon of a soil is a loam. The B horizon of the same soil is a clay loam. Neither horizon "fizzes" when treated with acid. The most likely designation for the B horizon is:
   Bk.
   Bt.
   Bw.
   Bcl.
   Bss.

3. The type of soil structure normally associated with a nasty sodium-affected claypan is:
   massive structure.
   granular structure.
   columnar structure.
   prismatic structure.
   matrix structure.

4. The most common clay mineral found in North Dakota soils is
    quartz.
    illite.
    kryptonite.
    kaolinite.
    smectite.

5. A clay mineral is comprised of a silicon-oxygen tetrahedral layer, combined with an aluminum-oxygen octahedral layer. The type of mineral most closely matching this description is:
    illite.
    kaolinite.
    vermiculite.
    bentonite.
    smectite.

6. A soil has a pH of 4.6 when suspended in water. This soil will likely be non-productive for farming because of problems caused by too much _____ on the cation exchange sites.
    Mg^{2+}.
    Ca^{2+}.
    H^{+}.
    Al^{3+}.
    Na^{+}.

7. A soil developed under deciduous forest in northern Minnesota, with a fully-formed Bt horizon, would most likely be classified as:
    a Mollisol.
    an Alfisol.
    a Vertisol.
    a Chernozem.
    a Krotovena Luvisol.

8. A soil emits nitrous oxide gas (N_2O), a potent air pollutant. This indicates that soil microbes have engaged in:
    ammonia volatilization.
    nitrification.
    denitrification.
    assimilatory nitrate reduction.
    nitrogen immobilization.

9. A young wheat crop has a normal green color, but is growing slowly in the spring, and forms no extra shoots, or tillers. The nutrient deficiency most likely causing this problem is:
    nitrogen deficiency.
    iron deficiency.
    sulfur deficiency.
    phosphorus deficiency.
    potassium deficiency.

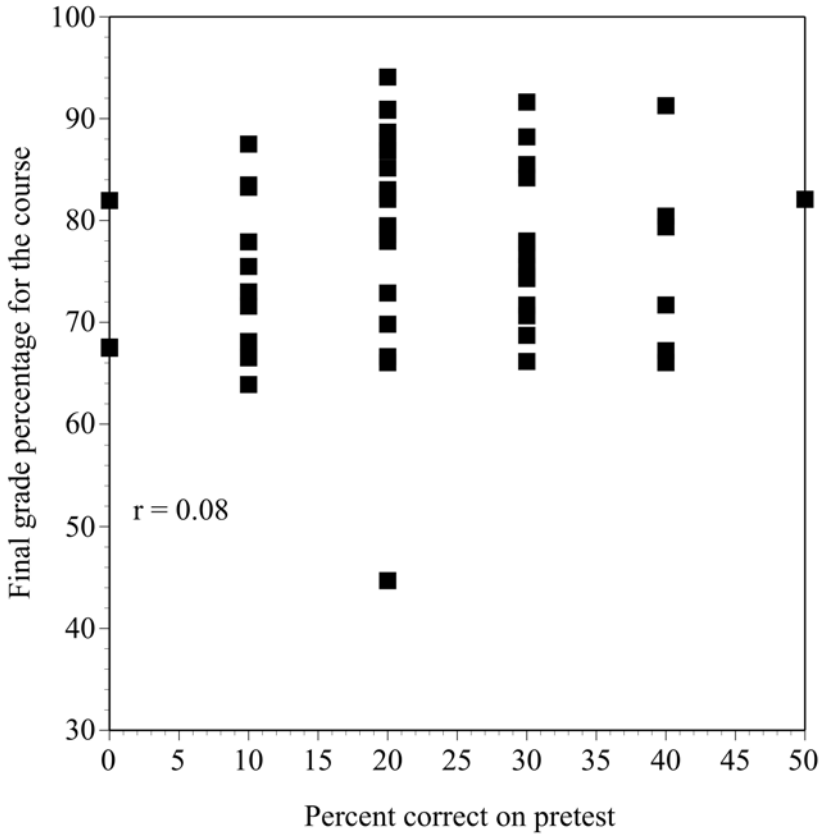
10. A plant develops a nutrient deficiency symptom. The youngest leaves turn yellow. This is typical for:
    a plant immobile nutrient.
    a soil immobile nutrient.
    a plant mobile nutrient.
    a plant immobile nutrient.

What Did You Learn?

The results of the pretest, averaged across all 10 questions, was 22% correct. Since there were five multiple-choice choices for most of the questions, that means that the students, as a whole, did little better on the pretest than had they selected random responses (20% correct).

This finding leads to an obvious conclusion. Students come into Soil 210 with little or no technical knowledge of soils. There is essentially no teaching of soil science at the Junior High or High School level.

There was no relationship between the students' performance on the pretest and their final grade percentage for the class, as shown in the following graph:



The graph suggests that there is not a cohort of students in the population of Soil 210 students who take the class having been exposed to the concepts outlined in the pretest.

Pretest vs. Final Exam results are shown in the following table. The results are analyzed relative to how often the material was covered, whether the material was covered once in lecture only, or if the material was covered multiple times (lecture and lab, or in more than one lecture.

The results indicate an average improvement of 25% correct on topics covered just once in lecture, and an average improvement of 52% on topics covered more than once.

Question	Pretest	Final Exam	Improvement (Final - Pretest)
	---------- % correct ----------		
	Material covered only once in lecture		
1	28	48	20
5	21	53	32
9	29	40	11
10	14	52	38
Average	23	48	25
	Material covered in lecture and lab, or in more than one lecture		
2	38	53	15
3	24	72	48
4	17	85	68
6	5	88	83
7	31	75	44
8	14	70	56
Average	22	74	52

What Will You Do Differently as a Result of What You Learned?

The pretest confirmed what we already knew....that almost all students come into this class with little or no prior knowledge about the discipline of soil science. That informs me, again, that I cannot assume any prior knowledge of the students and that I must be careful not to use undefined terms.

It also troubling to think about the results of the pretest, with regards to subsequent courses in soils offered by NDSU. A certain percentage of students want to take upper-division soils classes not having taken Soil 210. It is likely that most of these students have no technical knowledge of soils. Should we absolutely require Soil 210 for subsequent soils classes? The soils faculty should have this discussion.

The table listed above illustrates, again, the need to cover the most important concepts more than once. Covering something, however well, in lecture just once, only netted a 48% correct response on the final exam. That was boosted to 74% for concepts covered more than once. It is important for me to review with my colleagues what are the core concepts the students have to master, and to assure that these concepts are covered more than once in Soil 210.

Soil 217 - Introduction to Meteorology and Climatology – F. Adnan Akyuz

What Did You Do?

During the 2009-2010 academic year, two surveys were administered to the students at the beginning and the end of the semester. Participation was voluntary but all students that were present at the day of surveys participated. Each survey contained 20 responses; 10 beginning-of-semester questions and 10 end-of-semester questions. There were three types of questions to assess the student learning at varying depths; content learning, application learning and deep application learning.

The content learning questions were designed such that content learning could be distinguished from prior knowledge. Knowledge improvement was calculated by subtracting the responses from the first assessment survey from that of the second assessment survey. I was mostly interested in the number of responses that showed the confidence in the correct answer such as the response-D ("I have a clear idea of what these terms mean and I can explain them")

The application learning survey questions were designed to assess whether students had learned to use meteorological methods, concepts or theories acquired in the class in new situations or to solve problems. I was mostly interested in the number of responses that showed the confidence in the correct answer such as "I am certain that…".

The deep application learning questions were designed to assess students' ability to see patterns and separate concepts into component parts, thus deeper application learning. These types of questions usually starts with a paragraph that gives the students current setting followed by set of questions asking student to consider the initial conditions given in the paragraph in order to answer the question(s). Just like the application learning questions, I was mostly interested in improvement in the highest certainty in the correct answer.

What Did You Learn?

The numbers in the following table are the % knowledge improvement in the three category mentioned above; content learning, application learning, and deep application learning. They are the difference between prior knowledge and the knowledge gained after the class.

	Knowledge Improvement (%)
Content Learning	**64.21**
Application Learning	**25.57**
Deep Application Learning	**51.56**

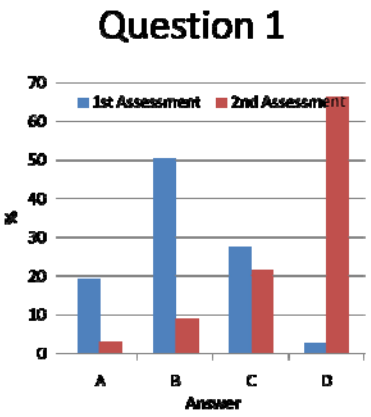
For example: On the average 3.36% of the students participated had a prior knowledge of the contents of the given subject. At the end of the semester, that percentage was 67.58% yielding 64.21% improvement in knowledge. Similarly, Application Learning and Deep Application Learning yielded positive trend with 25.57% and 51.56% knowledge improvement compared to prior knowledge respectively.

What will You Do Differently as a Res ult of What You Learned?

Analysis of individual questions allows me to see which subject requires more attention. From last year, I was able to see that the Atmospheric Moisture needed more attention. This year, I set aside one extra session for the Atmospheric Moisture. Improvement in students' learning was evident on their responses not only on the assessment but also in their exam outcome. Compared to last year, the student learning was improved in all aspects especially in Deep Application Learning. I managed to bring the learning to a level that I am satisfied and I will maintain the method of teaching in the same level next year.

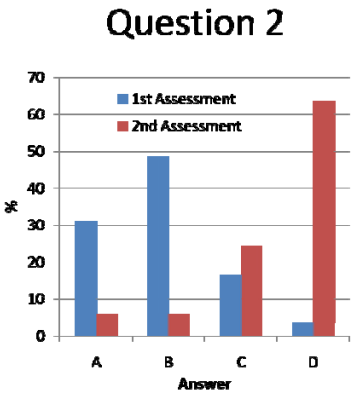
Questions as well as responses are given below. Blue bars and red bars are the responses on the first and second assessment surveys respectively. Plus sign (+) under the bar indicates the correct answer, while negative sign (-) indicates incorrect answer. Double positive sign (++) indicates the correct answer with confidence. Double negative sign (--) indicates incorrect answer while the student was confident that it was the correct answer.

Content Learning Questions



Two types of energy constantly move vertically through the atmosphere in the form of radiation. One type, ***solar radiation***, is generated by the Sun. The second type, called ***longwave radiation*** or ***Earth radiation***, is generated by the earth and clouds.

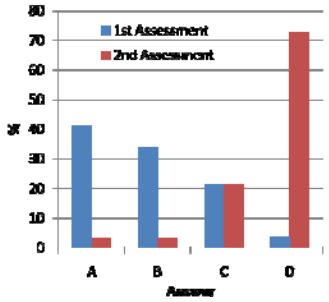
A. I have never heard of the italicized terms before.
B. I have heard of at least some of these terms before but I really don't understand what they mean.
C. I have some idea of what these terms mean, but I would have difficulty explaining them.
D. I have a clear idea of what these terms mean and I can explain them.



Latent heat of condensation is a form of energy that is released when water changes from a vapor to a liquid. In order to achieve condensation and to form a cloud, water vapor usually cools ***adiabatically*** until reaching its ***dew point*** temperature.

A. I have never heard of the italicized terms before.
B. I have heard of at least some of these terms before but I really don't understand what they mean.
C. I have some idea of what these terms mean, but I would have difficulty explaining them.
D. I have a clear idea of what these terms mean and I can explain them.

Question 3

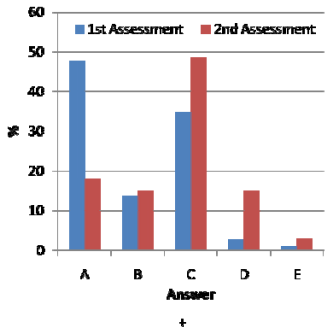


A *pressure gradient* is a horizontal difference in air pressure between two locations. A pressure gradient generates a *pressure gradient force* which causes air to move, creating wind. The *Coriolis force*, caused by the earth's daily rotation, helps determine which direction the wind blows.

A. I have never heard of the italicized terms before.
B. I have heard of at least some of these terms before but I really don't understand what they mean.
C. I have some idea of what these terms mean, but I would have difficulty explaining them.
D. I have a clear idea of what these terms mean and I can explain them.

Application Learning Questions

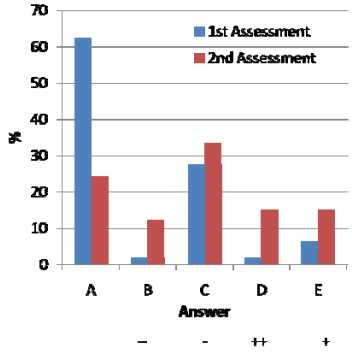
Question 4



Suppose lower pressure is located to the west, and higher pressure is located to the east. The pressure gradient force would be directed

A. I don't know
B. Toward the east
C. Toward the west
D. Toward the north
E. Toward the south

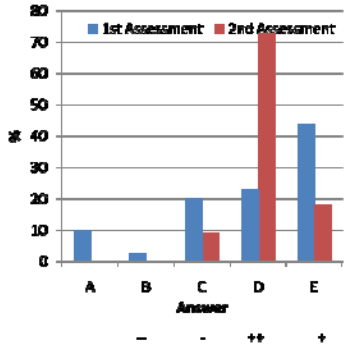
Question 5



Pressure gradient is much greater in vertical than in horizontal. Thus, wind speed is directly proportional with the pressure gradient force, meaning that you would expect higher wind speeds where pressure gradient is higher. Do we observe vertical wind speeds much greater than the horizontal wind speeds in general?

A. I do not know which would be greater.
B. I am certain that the vertical wind speeds are expected to be much greater than the horizontal wind speeds in general, and I can explain why.
C. I suspect that the vertical wind speeds are expected to be much greater than the horizontal wind speeds in general, but I would have difficulty explaining why.
D. I am certain that the horizontal wind speeds are expected to be much greater than the vertical wind speeds in general, and I can explain why.
E. I suspect that the horizontal wind speeds are expected to be much greater than the vertical wind speeds in general, but I would have difficulty explaining why.

Question 6



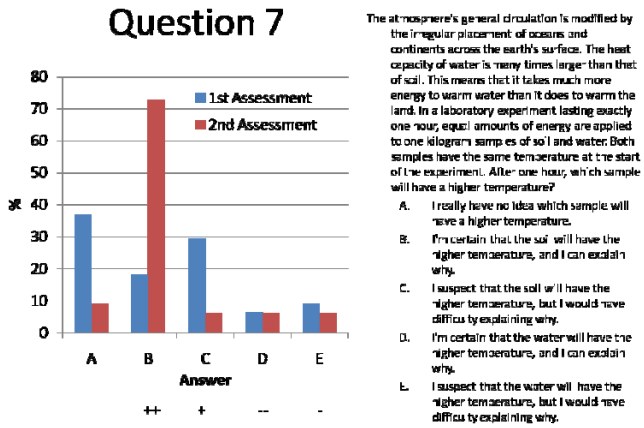
During winter when temperatures are very cold, frost sometimes forms on poorly insulated windows. Does frost form on the inside or the outside of the windows?

A. I really have no idea on which side of the windows frost will form.
B. I'm certain that the frost forms on the outside of the windows, and I can explain why.
C. I suspect that the frost forms on the outside of the windows, but I would have difficulty explaining why.
D. I'm certain that the frost forms on the inside of the windows, and I can explain why.
E. I suspect that the frost forms on the inside of the windows, but I would have difficulty explaining why.

Deep Application Learning Questions

Question 7 refers to the following paragraph.

The atmosphere's general circulation is modified by the irregular placement of oceans and continents across the earth's surface. The heat capacity of water is many times larger than that of soil. This means that it takes much more energy to warm water than it does to warm the land.

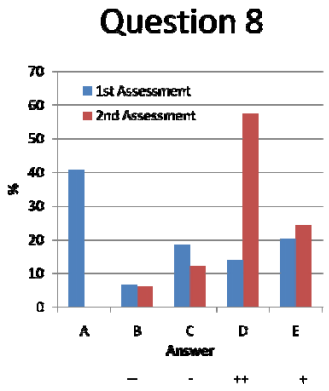


The atmosphere's general circulation is modified by the irregular placement of oceans and continents across the earth's surface. The heat capacity of water is many times larger than that of soil. This means that it takes much more energy to warm water than it does to warm the land. In a laboratory experiment lasting exactly one hour, equal amounts of energy are applied to one kilogram samples of soil and water. Both samples have the same temperature at the start of the experiment. After one hour, which sample will have a higher temperature?

A. I really have no idea which sample will have a higher temperature.
B. I'm certain that the soil will have the higher temperature, and I can explain why.
C. I suspect that the soil will have the higher temperature, but I would have difficulty explaining why.
D. I'm certain that the water will have the higher temperature, and I can explain why.
E. I suspect that the water will have the higher temperature, but I would have difficulty explaining why.

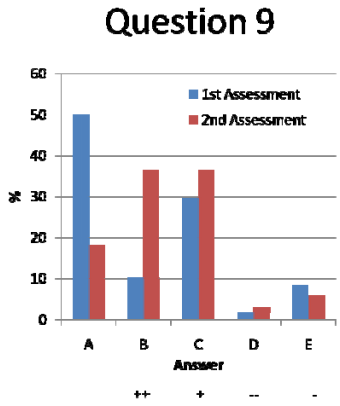
Questions 8 and 9 refer to the following paragraph.

Water vapor is one of several gases which absorb the longwave radiation emitted by the earth's surface. Clouds also absorb longwave radiation. On two different nights the temperature at sunset is 55°F and skies remain clear throughout the night. On the first night there is a moderate amount of water vapor in the atmosphere, and the temperature drops throughout the night to a minimum of 45°F.



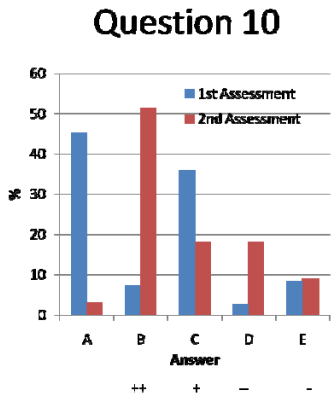
Suppose the sky had become cloudy during the first night. How would the clouds change the minimum temperature on this night?

A. I really have no idea what minimum temperature to expect.
B. I'm certain that the minimum temperature will be colder than 45°F, and I can explain why.
C. I suspect that the minimum temperature will be colder than 45°F, but I would have difficulty explaining why.
D. I'm certain that the minimum temperature will be warmer than 45°F, and I can explain why.
E. I suspect that the minimum temperature will be warmer than 45°F, but I would have difficulty explaining why.



On the second night the level of water vapor in the atmosphere dropped dramatically. What minimum temperature would you expect on the second night?

A. I really have no idea what minimum temperature to expect.
B. I'm certain that the minimum temperature will be several degrees colder than 45°F, and I can explain why.
C. I suspect that the minimum temperature will be several degrees colder than 45°F, but I would have difficulty explaining why.
D. I'm certain that the minimum temperature will be several degrees warmer than 45°F, and I can explain why.
E. I suspect that the minimum temperature will be several degrees warmer than 45°F, but I would have difficulty explaining why.



Upon entering your un-airconditioned apartment on a hot, muggy day, you remove a can of cold soda from the refrigerator and place it on the kitchen counter. Within minutes the outside of the can is dripping with beads of liquid water. How does the dew point temperature in the apartment compare to the temperature of the liquid in the soda can?

A. I really have no idea which temperature is higher.
B. I'm certain that the dew point temperature is higher than the temperature of the liquid in the soda can, and I can explain why.
C. I suspect that the dew point temperature is higher than the temperature of the liquid in the soda can, but I would have difficulty explaining why.
D. I'm certain that the dew point temperature is lower than the temperature of the liquid in the soda can, and I can explain why.
E. I suspect that the dew point temperature is lower than the temperature of the liquid in the soda can, but I would have difficulty explaining why.

SOIL 322 – Soil Fertility and Fertilizers - Larry Cihacek

What Did You Do?

A twenty question multiple choice pretest covering key concepts of the course was administered during the first meeting of the class to 38 students. The same questions were incorporated into the final exam at the end of the semester.

What Did You Learn?

An analysis of both the pretest and final test scores showed that 59.3% of the questions were answered correctly in the pretest and 75.3% of the questions were answered correctly during

the final exam for an improvement of 16%. The greatest improvement was for a question on soil N immobilization which was answered correctly by 13% on the pretest and 62% on the final for a 49% improvement in the score. The least improvement was for questions that were answered with 95 to 97% accuracy in the pretest and were answered with similar accuracy in the final exam.

SOIL 351 - Soil Ecology – Laura Overstreet

Name	Pre-test	Post-test	Difference	n=9 questions
Student 1	3	7	4	
Student 2	2	7	5	
Student 3	7	4	-3	
Student 4	4			Student did not attend class on day of post-test
Student 5	4	8	4	
Student 6	1	6	5	
Student 7	5	5	0	
Student 8	2	6	4	
Student 9	3			Student dropped course
Student 10	0	4	4	
Student 11	3	4	1	
Student 12	2	6	4	
Student 13	3			Student did not attend class on day of post-test
Student 14	2	5	3	
Student 15	2			Student did not attend class on day of post-test
Student 16	2	8	6	
Student 17	1	5	4	
Student 18	3			Student did not attend class on day of post-test
Student 19	3	5	2	
Student 20	6	8	2	
Student 21	2	5	3	
Student 22	2	6	4	
Student 23	2	7	5	
Student 24	3	5	2	
Average change			3.105263	
% increase			34.50292	

Responses to Post-Test Assessment by students of SOIL 351, Soil Ecology

Question: What is the most meaningful thing you learned from this course? What percentage of the information taught in the course do you predict you will ever use again?
All responses recorded just as written

- How SOM is broken down, 20%
- Soil is not just an endless resource as humanity has treated it for thousands of years. It is a living and dynamic system that must be managed properly. I would say that 80% I will retain for later use!
- The Nitrogen cycle, 50%
- The microorganisms vital role in soil formation, 87.5%
- Most of what we learned I feel will be useful especially about mycorrhizal relationships and things we talked about concerning no till, that it might not be best
- Nitrogen cycle and many forms it has; functions and processes of soil mo's; 99-100%! I even kept my book for future reference!
- Different sizes of organisms – puts things into perspective; about 30%
- I don't think there was one topic that was more meaningful than the other but I will use about 80% of this course material in the future
- That soil is a living working entity and controls everything in the relm of living things. Probably 70%
- The relationships between the micro, mesa, and macrofauna and their importance in decomposition. I'll probably use 15-20%.
- I learned a lot of things that I enjoyed like carbon sequestration, bioremediation, and the different organisms that live in the soil. I hope to use a lot of the knowledge I learned in this class to come in the future.
- Learned that the soil is more fragile than a I ever thought, it's a very complex system that has to be respected. Prob 50%
- 95%; The interaction and description of the soil macrofauna
- Importance of soil microorganisms in the breaking down and transformation of SOM. 50%
- Importance of fungi in the soil and how a producer can be shooting himself in the foot spraying fungicides. I would estimate 50-60% directly as a whole, a better understanding of soil ecology will be beneficial to me (what I learned in the class)
- microbial species, 75%
- I thought it was interesting to learn about the organisms in the soil.
- The information on the third exam; I will probably use about 15% of the information again
- The effects of mycorrhizal relationships on plant growth. 25%

SOIL 410/610 – Soils and Land Use – Tom DeSutter

What Did You Do?

The following questions were given as pre- and post-assessment questions:
1. What are the five soil forming factors?

2. What are the forms of nitrogen and phosphorus that you would expect to see in the soil? (common names and/or structures are fine).

3. If 1,000 kg of manure at 33 percent gravimetric water content was applied to the soil for fertilizer, how much oven-dried manure was actually applied?

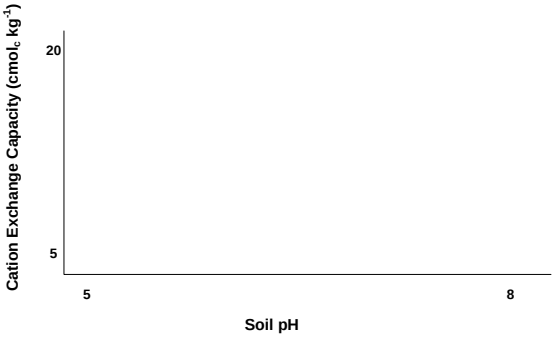
4. If a Barnes soil series has sand, silt, and clay contents of 44, 34, and 22%, respectively, and a Flaming soil series has sand, silt, and clay contents of 89, 6, and 5%, respectively, which of the two soil series likely has:
-the most organic carbon?_____
-the highest concentration of base cations?_____
-the greatest ability to leach water?_____
-the greater aggregate stability?_____
-the greater potential to be wind erodible?_____

5. Rank the following salts that are commonly found in soil from the most soluble (1) to the least soluble (4):
_____ NaCl
_____ $CaCO_3$
_____ $CaCl_2$
_____ $MgSO_4$

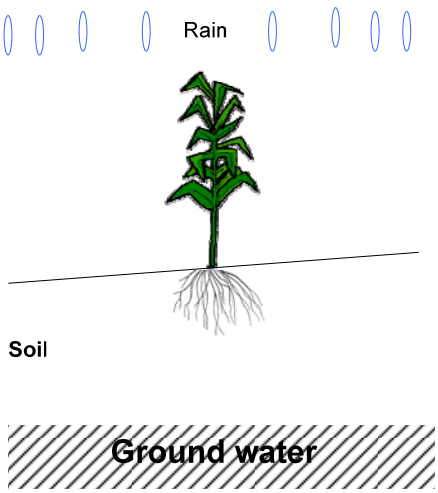
6. What does the following soil nomenclature mean?

“Coarse-loamy, mixed, superactive, mesic Typic Haplustept”

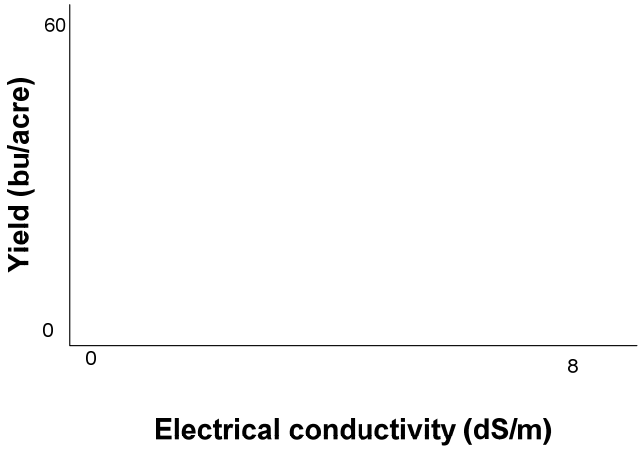
7. Using the graph provided, show how soil pH and CEC are related when: 1) there is **NO** organic carbon in the soil and 2) when there **IS** organic carbon present in the soil.



8. In the picture below, use arrows and describe the hydrologic cycle:



9. Using the graph provided, show how soil salinity influences the yield of soybeans.



10. What is the total porosity of a soil that has a bulk density of 1 g/cm^3 and a particle density of 2.65 g/cm^3?

11. Unit conversion: mg/kg to ng/mg?

12. If the concentration of H^+ in the soil is 1 x 10^{-6}, what is the pH of this soil?

13. If a soil sample was taken in a cylinder having a diameter of 10 cm and a height of 6.4 cm, what is the bulk density of this soil if its oven dry weight is 600 g? ($V = \pi * radius^2 * height$)

14. A saturated paste extract came back from the soil testing laboratory and results are below. What is the exchangeable sodium percentage (ESP) for this soil?

Cations	$cmol_{(c)}\ kg^{-1}$
Ca	6.7
Mg	5.2
Na	2.8
K	1.1

Student diversity

As in the past, this course had high student diversity and the enrollment has increased to 38 (18 410 and 20 610). Of the 410 students, 13 were NRM majors and the remaining students were TriCollege (1), Crop and Weed Sciences (1), General Agriculture (1), Soil Science (1), and Biological Sciences (1). Of the 610 students, 12 were NRM and the remaining students had majors of Soil Science (2), Plant Sciences (3), Horticulture (1), Civil Engineering (1), AgBioSyst Engineering (1). There were 5 and 12 women students in the 410 and 610 courses, respectively, and two international students (Ghana and Bangladesh) in the 610 course.

What Did You Learn?

Student answers were scored on the following criteria: i) essentially correct; ii) about 40-60% correct; iii) less than 40% correct or just wrong; and iv) no answer given or does not know (Table 1 and Table 2). The total enrollment in the course was 38, but there were only 35 students who completed both the pre- and post-assessment tests.

Overall, active learning was taking place (Table 1 and Table 2). All of the questions had at least some improvement from pre-test to the post-test questions being “essentially correct”. However, questions 7 and 11 caused some major difficulties for the students and I will take blame for 11, but not for 7. Question 11 could have been written more clearly and I will change that for next year. Question 7, however, was discussed numerous times and was on one of their exams. Over the semester the students responded well to my “figure drawings”, but some reason this one did not work for them. I guess more work is needed…

I was very pleased when looking at the pre- and post-assessment question 6. I did not think that many, if any, students would be able to answer 6 on the pre-assessment and I was correct (6% for 410; 0% for 610). However, we discusses soil taxonomic names in depth due to the fact that if one can understand these names then one can have a good understanding of Land Use. During the post-assessment, 59 and 83% of the 410 and 610 students, respectively, were essentially correct! Obviously not all of the results were this good, but that just means that I need to work harder at stimulating student learning.

Table 1. Student pre- and post-assessment answers for Soil 410 (spring, 2010). See above for specific questions. Each value in the table is the number of students falling within respective categories. A total of 17 students took both pre- and post-assessments.

	Essentially correct		≈40-60% correct		<40% or just wrong		No response or "don't know"	
Question	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
1	7 (41)†	13 (76)‡	7 (41)	3 (18)	3 (18)	0	0	0
2	2 (12)	9 (53)	3 (18)	5 (29)	5 (29)	2 (12)	7 (41)	1 (6)
3	5 (29)	12 (71)	0	0	7 (41)	4 (24)	5 (29)	1 (6)
4	8 (47)	13 (76)	5 (29)	3 (18)	3 (18)	1 (6)	1 (6)	0
5	1 (6)	7 (41)	6 (35)	7 (41)	8 (47)	3 (18)	2 (12)	0
6	1 (6)	10 (59)	0	6 (35)	7 (41)	0	9 (53)	1 (6)
7	0	1 (6)	0	1 (6)	9 (53)	11 (65)	9 (53)	3 (18)
8	6 (35)	11 (65)	9 (53)	4 (24)	2 (12)	1 (6)	1 (6)	0
9	12 (71)	14 (82)	0	0	3 (18)	2 (12)	1 (6)	0
10	0	6 (35)	0	1 (6)	6 (35)	6 (35)	11 (65)	3 (18)
11	0	5 (29)	0	1 (6)	4 (24)	7 (41)	13 (76)	4 (24)
12	7 (41)	10 (59)	0	0	3 (18)	4 (24)	7 (41)	2 (12)
13	0	6 (35)	0	3 (18)	8 (47)	7 (41)	9 (53)	1 (6)
14	2 (12)	7 (41)	0	7 (41)	5 (29)	1 (6)	10 (59)	2 (12)

† Percent of students whose answer was "essentially correct" during the pre-assessment.
‡ Percent of students whose answer was "essentially correct" during the post-assessment.

Table 2. Student pre- and post-assessment answers for Soil 610 (spring, 2010). See above for specific questions. Each value in the table is the number of students falling within respective categories. A total of 18 students took both pre- and post-assessments.

	Essentially correct		≈40-60% correct		<40% or just wrong		No response or "don't know"	
Question	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
1	3 (17)†	6 (33)‡	2 (11)	12 (67)	9 (50)	0	4 (22)	0
2	2 (11)	15 (83)	3 (17)	2 (11)	4 (22)	0	9 (50)	1 (6)
3	8 (44)	11 (61)	0	0	5 (28)	7 (39)	5 (28)	0
4	5 (28)	13 (72)	7 (39)	5 (28)	5 (28)	0	1 (6)	0
5	4 (22)	14 (78)	5 (28)	2 (11)	7 (39)	2 (11)	2 (11)	0
6	0	15 (83)	2 (11)	2 (11)	1 (6)	1 (6)	15 (83)	0
7	0	1 (6)	1 (6)	0	7 (39)	13 (72)	10 (56)	4 (22)
8	12 (67)	18 (100)	4 (22)	0	0	0	2 (11)	0
9	7 (39)	15 (83)	2 (11)	1 (6)	9 (50)	1 (6)	0	0
10	1 (6)	8 (44)	0	6 (33)	5 (28)	4 (22)	12 (67)	1 (6)
11	1 (6)	5 (28)	1 (6)	4 (22)	9 (50)	5 (28)	7 (39)	4 (22)
12	7 (39)	11 (61)	0	0	5 (28)	3 (17)	6 (33)	3 (17)
13	2 (11)	11 (61)	2 (11)	2 (11)	6 (33)	4 (22)	8 (44)	1 (6)
14	0	13 (72)	3 (17)	0	0	4 (22)	15 (83)	1 (6)

† Percent of students whose answer was "essentially correct" during the pre-assessment.
‡ Percent of students whose answer was "essentially correct" during the post-assessment.

Observations and Conclusions

I was again pleased with the course. I implemented three case studies this semester and hope to use more in the future. The approximate 50:50 split of 410 and 610 students causes some problems with time management and what projects constitute 610 vs 410 learning. The 610 students this year had a choice of projects: a 30 minute lecture + 5 extended annotated bibliographies or 15 extended annotated bibliographies (Exhibit A). Due to many students choosing the lecture + five format we had to meet for three nights outside of the normal lecture time. This was a good experience for the students since they had to be prepared for a 30 minute lecture. I did not allow the students to use powerpoint except when showing pictures for figures/tables---chalkboard only. The students that did the 15 bibliographies wished they would have done the lecture + five. The 410 students were required to give a 12 minute presentation on a soils and land use topic. The quality of the presentations ranged widely, and topics ranged from earthworm invasions to bombturbation ("the term 'bombturbation' for cratering of the soil surface and mixing of the soil by explosive munitions, usually during warfare or related activities" (Hupy and Schaetzl, 2006).

What Will You Do Differently As a Result of What You Learned

Again, one of the main challenges that I had during the semester is the separation of 410 and 610 students in the classroom. I feel that 610 students should have a much more rigorous course setting than 410 students, but this is hard with both in the same room. Plus, many (about 50%) of the 610 students had not had a soil science course whereas all of the 410 students had at least SOIL 210. I still struggle with this format, but am learning to accommodate everyone's backgrounds. I am going to change the time of my course from MWF to TR to increase learning duration. I do not think that 50 minute periods are long enough for the information I need to present.

Exhibit A
SOIL 610 Syllabus Supplement (Spring 2010)
From Syllabus
Project for 610 students (150 points)
To meet the rigors of a graduate level course, 610 students must choose between two options for their project. These options are: 1) using 5 peer-reviewed research articles that discuss a particular soil and land use topic, prepare an extended annotated bibliography of each article and also create a 30 minute lecture using these articles as your foundation; or 2) prepare an extended annotated bibliography of 15 peer-reviewed research articles. All lectures will be conducted outside of the regular class meeting time and only your fellow 610 students will be required to attend. *Soil and land use topics must be approved by me prior to starting the project.*

The annotated bibliography
"Definition: An annotated bibliography is an organized list of sources, each of which is followed by a brief note or "annotation."
These annotations do one or more of the following:

- describe the content and focus of the book or article
- suggest the source's usefulness to your research
- evaluate its method, conclusions, or reliability

- record your reactions to the source." (http://writing.wisc.edu/Handbook/AnnotatedBibliography.html)

The overall grading will be simple: 1) you must do all of the bibliographies that are required and if you don't, the most points you can earn will be 66% of the total possible points; 2) for those doing the lecture and extended annotated bibliographies (n = 5), your extended annotated bibliographies will be worth 20 points each (100 points) and presentation will be worth 50 points; 3) for those doing only the extended annotated bibliographies (n = 15), your extended annotated bibliographies will be worth 10 points each (150 points). See rubric below for specific details on how I will grade each extended annotated bibliography. An example prepared by the instructor will be distributed.

Rubric for extended annotated bibliographies (scaled accordingly for each project)

Annotated bibliography	A	B	C	D	
I. Describe the content and focus (total points = 8)					
1. What soil and land use topic is being discussed?	2.7	2.2	1.8	1.4	
2. What is the justification for the research/review?	2.7	2.2	1.8	1.4	
3. What are the objectives of the research/review paper?	2.6	2.2	1.8	1.4	
II. Methods, Results, Conclusions (total points = 8)					
1. Description of research approach.	2	1.7	1.4	1	
2. Description of soils used in the research.	2	1.7	1.4	1	
3. Evaluation of results	2	1.7	1.4	1	
4. Evaluation of conclusions and how the conclusions impact land use.	2	1.7	1.4	1	
III. Reaction (total points = 4)					
1. Personal reaction to the paper.	2	1.7	1.4	1	
2. Statement of wider impact on soils and land use.	2	1.7	1.4	1	
IV. Overall Point Totals					

Grand Total

Name of Presenter:_____ Name of Reviewer:_____

The lecture

The creation of lecture material to present to your peers is a great learning experience. The lecture will need to be 30 minutes in length and must incorporate your annotated bibliographies as lecture material. You can also supplement these bibliographies with textbook material, no Wikipedia is permitted. Your lecture must be presented to your peers using the chalkboard/whiteboard, no PowerPoint allowed. However, you can use the overhead or computer (PowerPoint) to show pictures and to display diagrams. 610 students will need to take notes because each student giving a lecture will be required to write test/quiz questions. Your lecture will be graded on your instructor's assessment of your teaching/preparation, and your peer's assessment of your teaching/preparation. All lectures will be conducted outside of the regular class meeting times and all 610 students are required to attend the lectures (I will provide snacks and food). See rubric below for specific details on how I and your peers will grade your lecture. Your grade from the lecture will be the average score from me and your peers.

Presentation

Your presentation must include:

1) A brief introduction to what will be discussed.

2) Important terms and concepts relating to your lecture, which may be introduced through presentation or through handouts.
3) A well thought out lecture of your topic that includes actual data and example calculations. **Note: PowerPoint can't be used for your lecture**.
4) Summary of lecture/discussion.

Rubric for lecture

Evaluation	A	B	C	D	
I. Presentation (total points = 50)					
1. Followed directions- attention to instructions	10	8	6	4	
2. Organized- appropriate background knowledge, logical progression, summary of lecture,	10	8	6	4	**Grand Total**
3. Speech- mechanics, avoided use of slang, avoided use of "um" "like" "uh"	10	8	6	4	
4. Visual aids- overheads, handouts, chalk board	10	8	6	4	
5. Response to questions	10	8	6	4	
II. Overall					

Comments (very valuable!):

SOIL 433/633 – Soil Physics – Lyle Prunty

What Did You Do?

Soil 433/633 was taught for the second time after realignment of soil science courses. The same textbook, D. Hillel's "Environmental Soil Physics" (1998, Academic Press), was used.

The textbook was covered comprehensively, but with the topics in modified order compared to the chapter order in the book. Students were expected to read book chapters as identified in the syllabus. Students were also informed that review of topics from a basic soils text at the time they arose during the course would be a good idea.

A pretest - posttest assessment strategy was used. The first class session was partially devoted (about 1/2 hour) to the students completing the pretest. Similarly, the last meeting of the semester was committed partially for the students to complete the posttest, which was identical to the pretest. As with previous versions of the pretest-posttest, the questions were based mostly on the Council of Soil Science Examiners and Soil Science Society of America document "Soil Science Competency Areas and Performance Objectives."

Generally, the students were provided with class note outlines that they could complete during class as the material was presented in detail. The degree of detail in the outlines varied according to the subject and the time available to cover it.

Thirteen problem sets were assigned, collected, and graded during the semester. Mostly, the problem sets were due one week after distribution. The textbook provides sample problems at the end of each chapter. The solutions to these sample problems are also presented in the textbook. Problems assigned to the students were mostly takeoffs on the book's sample problems. Sometimes only the given values were changed so the students simply had to use

different numbers in the calculations. Sometimes, the problems were modified more extensively, perhaps asking for derivation of a different parameter.

Seven exercises constituted the laboratory portion of the course. For each, a prelab was handed out with data that could typically be obtained in that lab. The students were expected to successfully complete the needed calculations using the given prelab numbers before submitting their own lab reports. Blank forms as used to provide the prelab data were also made available for students to use a data sheets to record their own data. The intent of including the prelab work was to help students stay "on track" with their lab work.

What Did You Learn?

Average of the pretest scores was 23, based on nine tests taken. The average of five posttest scores was 88. This seems to be a very satisfactory result. The low initial score tells us that the particulars of this course are little known to those who have not been specifically exposed to the subject matter. In other words the test is not one of general knowledge, but one targeted at the subject of this course. The final scores, averaging near 90, show that generally these students learned most of the things they were expected to learn in the course. On some of the individual, qualitative questions the rise in scores was not so dramatic.

Use of the prelabs was successful enough to continue using the idea. It seemed that there were fewer reports with clear calculation errors than in the past. In general the laboratory scores were very satisfactory.

There was only one comment included in the student rating of instruction results. It was basically favorable. Three of the six standard questions rated this course higher than the department average.

What Will You Do Differently as a Result of What You Learned?

I expect few changes when teaching this course next fall. I believe I have identified those topics that need additional time for students to grasp. If the areas of less than optimal preparation in the next class are different than in the past, then the approach can be adjusted. I believe the nearly constant feedback from problem sets, quizzes, and lab reports allows me to identify when students are having difficulties.

SOIL 444 – Soil Genesis and Survey – David Hopkins

What Did You Do?

This 4 credit field oriented course is taught in the autumn semester and assessment was conducted via a pre and post test consisting of 7 general questions ranging in difficulty, and a more difficult conceptual question (8) was included on a second page. For some of the more difficult questions, i.e., 2, 4, 5, 6 responses were evaluated rather rigorously and a rating of “essentially correct” was given only if students were able to provide examples to justify their argument. Answers were assigned to classes of essentially correct, 40-60 % correct, <40% or simply incorrect, and No response, or “don’t know”. An example of the complete

spreadsheet for 2009 is shown in the appendix, as well as a more informal indication of student learning (Appendix B).

The 7 questions are:

1. What are the Five Factors of Soil Formation?

2. What is Soil Taxonomy? Why is it important and how does it work?

3. What is the difference between illuviation and eluviation? Give an example of both.

4. What are secondary minerals? How are they important in soil genesis or soil management?

5. What is a prairie soil profile (i.e., a typical mollisol)? Do they have a distinct pattern of soil horizons?

6. Why do mature soils in Tennessee or France (or any other humid location) possess such different properties than their parent material. Provide some evidence of why this is true.

7. Dr. Goos wanted to know what the principle factor is that drives, e.g. “governs” profile development in soils.

The eighth question involved a hypothetical landscape setting with rolling topography and an indication of a shallow groundwater; the full question and graphic are shown in the appendix. The major goal from a teaching perspective for this question was to assess how well students understood concepts of soil parent material, sediment size, and topographic relief and the way these three factors govern capillary rise, soil water interactions, and genetic changes in soil properties over time. It is a pretty complex scenario.

<u>What Did You Learn?</u>

Results for the 2009 assessment offer a sobering contrast to 2008 results. Evaluation was certainly not rigid but I wanted to see students incorporate evidence in their responses. Most students knew something of the five factors of soil formation in the pre-test (64%), and by the end of the semester 83 percent had it right. For such a simple topic, it is hard to imagine why 17 percent of the students did not get question 1 correct. The Soil taxonomy question was graded rather easily in the pre-Test and much more rigorously for the post test, because Taxonomy is covered extensively. If students did not supply some higher order thinking in responses, then they were not given full credit. So this metric indicates that for question 2 there was only an 8% increase in learning; that is not obviously accurate.
On the topic of eluviation versus illuviation (question 3) there was a significant increase in the number of students who understood the concept, 46 percent improvement in correct answer, and often these showed deeper consideration, terms like “movement of solutes through the soil profile and dissolution” were used. For some reason the concept of and parent material and it transformation in the soil profile remains problematic. Only half of the students were able to adequately define primary and secondary minerals in the Pre-Test, but the post test showed only an 13 percent improvement after considerable coverage and field inspection of mineralogy during the course. For questions 5-7 the degree of improvement was in the high teens- not too encouraging.

Question 8 was specifically developed to assess knowledge of higher level concepts, less than half of the students answered the question reasonably well in the Pre-Test. By the end of the semester about 78 percent of the students could answer the question and provide sound evidence of soil/groundwater interactions.

Soils 444/644 Assessment Questionaire Summary-2009			
	Pre-Test	**Post-Test**	**Degree of**
Question	**Essentially**	**Essentially**	**improvement**
	correct	**correct**	
	---------- % ----------		
1	0.64	0.83	0.19
2	0.40	0.48	0.08
3	0.32	0.78	0.46
4	0.52	0.65	0.13
5	0.44	0.61	0.17
6	0.56	0.74	0.18
7	0.44	0.61	0.17
8	0.48	0.78	0.30

What Will You Do Differently as a Result of What You Learned?

There is still need for clearer instruction and exposure to concepts of Soil Taxonomy (question 2) and the transformation of soil parent materials through weathering and how that affects primary and secondary minerals in soils (question 4 and 6). These are critical course objectives and the teaching approach needs to be modifies in terms of presentation and perhaps student homework, or group work that could specifically address this issue. Students prepared several soil monoliths from the field trip experiences in 2009 that spanned 3-4 indoor laboratory sessions. These will be a housed in a permanent display in Walster Hall (Note: Student appreciation of the field trips is evident in Appendix B). A logical graduate student project therefore, might be to use these monoliths as a teaching and learning module with a focused evaluation of soil mineral transformations resulting from soil genesis.

In addition to the questionnaire, I have typically asked students what they felt believed was the most significant aspect of the course that extended their knowledge in pedology and these responses are informative and suggest that learning is taking place that will benefit the students in their professional careers (see attached student testimonials from 2009, note the detail in the graduate students comments).

Appendix A: Example of Pre-test and Post Test analysis

Soils 444/644 Pretest		Given after Lecture 1, 2009; n=25		
Survey Results				
Question	**Essentially correct**	**~ 40-60 % correct**	**< 40 % or just wrong**	**No response or "don't know"**
1	16	4	4	1
2	10	9	5	1
3	8	7	6	4
4	13	6	4	2
5	11	6	3	5
6	14	4	4	3
7	11	1	8	5
8	12	6	3	4
Proportion of class	**Essentially correct**	**~ 40-60 % correct**	**< 40 % or just wrong**	**No response or "don't know"**
1	0.64	0.16	0.16	0.04
2	0.40	0.36	0.00	0.00
3	0.32	0.28	0.24	0.16
4	0.52	0.24	0.16	0.08
5	0.44	0.24	0.12	0.20
6	0.56	0.16	0.16	0.12
7	0.44	0.04	0.32	0.20
8	0.48	0.24	0.12	0.16

Question	**Essentially correct**	**~ 40-60 % correct**	**< 40 % or just wrong**	**No response or "don't know"**
1	19	4	-	-
2	11	11	-	1
3	18	3	2	-
4	15	7	1	-
5	14	9	-	-
6	17	6	-	-
7	**14**	**2**	7	-
8	**18**	**3**	-	2
Proportion of Class				no
Question	**Essentially correct**	**~ 40-60 % correct**	**< 40 % or just wrong**	**response or "don't know"**
1	0.83	0.17	0.00	0.00
2	0.48	0.48	0.00	0.04
3	0.78	0.13	0.09	0.00
4	0.65	0.30	0.04	0.00
5	0.61	0.39	0.00	0.00
6	0.74	0.26	0.00	0.00
7	0.61	0.09	0.30	0.00
8	0.78	0.13	0.00	0.09

Appendix B: Student responses to the final question "what was the most interesting and yet trivial thing that you learned this semester?" Three of the 23 students taking the Post test were not able to fill out this question due to a printing error.

Student	Comment
1	The E horizon used to be called A2
2	I learned that Team Effervescents Rules!
3	Everything that comes to mind I would not consider trivial; Many things stand out, but perhaps the effects of micro-topography are more appreciated now. (Grad)
4	No soil is exactly like another. We can learn the basic horizons and how to identify them, but every situation will create its own unique "story" to be read.
5	Humic/fulvic acids and their ability to break down Fe-Mg rich minerals; ecological importance of soils-I love ecology
6	The phrase "Glaciolacustine lithologic discontinuity"
7	Climate is not the major controlling factor in pedogenesis as is micro-topography; catena; how to diagnose horizons; soil maps are not always right/accurate; more hands-on than expected. (Grad)
8	Water can move up through a soil series via capillary rise. Cool!
9	The transformation of primary minerals. It is amazing how resistates can decompose in certain conditions.
10	The most interesting trivial thing I learned was about grus formation. Before the trip to the pit I had not encountered rocks that I could easily crush to sand with my bare hands.
11	The "water drop" and its affects upon the soil
12	Honestly, that all "things" are related. There is always a linkage to something else.
13	The most interesting thing I have learned this semester is how CLORPT has worked to develop soils and its implications for human use.
14	The field trips were extremely helpful in understanding the lecture material. The most interesting was the horizonation of Spodosols. (Grad.)
15	The difference between quarts and quartz
16	The more I learn about soils, the less I know and the more I want to know more. Trivial? Probably that I didn't realize how much pedogenesis depends on geology. (Grad.)
17	Vertisol comes from "Invert"
18	Ped face
19	About the different horizons especially Spodosols and oxisols
20	The concept of my home soil, the Nicollet series, was actually explained in depth in the Schatzel and Anderson textbook.

SOIL 763 – Advanced Soil Physics – Lyle Prunty

What Did You Do?

The student enrolled in this class had taken Soil 633 from me the previous semester, so the level of preparation of the class was well known to me. On the first day of class I, as usual,

presented the course syllabus and went through it item-by-item with the student. The student was requested to submit information about any particular topics that it might be desirable to cover in the course, from the student perspective. The chapter of the ASA, CSSA, SSSA Style manual on units and measurements was handed out and reviewed to emphasize the proper use of notation for the SI system of units. The mathematics of logarithms was reviewed, along with some numerical examples. During the first class period I also administered the pretest for the semester. The resulting score on the pretest was 85.

Review continued during the second class period. The final exam from Soil 433/633 in 2008 was used. A copy of this exam, with answers, was provided and each question was discussed in appropriate detail. The reason for using the 2008 exam was that the student had just the previous month taken the final exam for this course as a 2009 student. The 2008 exam, while covering the same course material, used somewhat different questions, so provided better review of some topics than using the 2009 exam would have.

Student learning evaluation through the semester and for the course grade relied on scored problem sets, quizzes, examinations, and laboratory reports. The examinations quizzes and problem sets were all problem-oriented in that calculation or mathematical solution of quantitative problems was required, along with numerical answers. This is a very traditional set of evaluators for a physical science course. A posttest was not given at the end of the course.

What Did You Learn?

Pretest score was 85. This indicated to me unusually comprehensive preparation on the part of the student for this course. This is not too surprising since the student had just completed Soil 633 about 3 weeks previously. With a pretest score this high there was little point in administering the posttest.

All values on the SROI report were 4's and 5's. The student comments were favorable.

What Will You Do Differently as a Result of What You Learned?

There are some items that should be done again for subsequent teaching of this course.

The Hydrus 1-D computer simulation program was used in this course to provide an example of a soil water simulation model. This is useful and should be done again the next time the course is taught. The model specifically, I have found, enables explanation of flux versus constant head infiltration processes.

I will continue to include review material as appropriate for the preparation level of the students.

The SSSA style manual handout on units and prefixes will be used again.

The central goal of this course is to introduce students to physical principles governing soil behavior and how these principles are represented mathematically. At completion the student should be familiar with major soil physical processes and how they are quantitatively evaluated using equations. This includes knowledge of computations associated with laboratory procedures in order to find the numerical value of a property. To attain the course

goals the suite of techniques used includes examinations with necessity to solve mathematically posed questions, quizzes, problem sets that are turned in and graded, sometimes with a requirement for revision if not initially correct, and laboratory reports. These techniques are time-tested and reflect, in my observation, the ability of the student to make use of fundamental soil physics principles. Some students say the they suffer from math anxiety that reduces the reliability of the above assessment tools. This may have applied to some students I have had, but reliable alternative methods present even more problems, I expect.

SUMMARY

Assessment of student outcomes is conducted by the School of Natural Resource Sciences annually for the bachelors, masters, and doctorate degree levels using the enclosed rubric. The courses designated for assessment in 2009-2010 were: ENT 210, Insects, Humans, and the Environment; ENT 350, General Entomology; NRM 225/RNG 225, Natural Resources & Agroecosystems; NRM 150, Natural Resources Management Undergraduate Orientation; NRM 432/632, Environmental Impact Statements; NRM 453/RNG 453, Rangeland Resources Watershed Management; NRM 491/690, Natural Resources Management Undergraduate /Graduate Seminar; NRM 701, Terrestrial Resources Managemetn; RNG 450/650, Range Plants; RNG 452/652, Geographic Information Systems in Range Survey; RNG 462/662, Rangeland Planning and Analysis; RNG 765, Analysis of Ecosystems; SOIL 210, Introduction to Soil Science; SOIL 217, Introduction to Meteorology and Climatology; SOIL 322, Soil Fertility and Fertilizers; SOIL 351, Soil Ecology; SOIL 410/610, Soils and Land Use; SOIL 433/633, Soil Physics; SOIL 444/644, Soil Genesis and Survey; SOIL 763, Advanced Soil Physics.

Improving assessment of student learning and the faculty's understanding of assessment tools within the School is a goal of the director, Don Kirby. The Director has provided examples of assessment tools, assessment reports, and discussed these with faculty during the past year. Additionally website information provided by the Director of University Assessment has been presented to the faculty with the intent of improving understanding of assessment techniques and their uses. New faculty members get personalized instruction from the Director concerning the need for proper assessment of student learning activities. All faculty have been requested to provide intended student outcomes on the syllabus of the courses they instruct.

For assessment activities, faculty were asked to assess their courses using an assessment tool of their selection, then answer three specific questions for each course. The questions were: 1) What did you do? 2) What did you learn? and 3) What will be done differently as a result of what was learned?

As was the case last year, numerous tools of assessment were adopted for use by the combined faculty of the School of Natural Resource Sciences. The pre- and post-testing continued to be the work horse for assessment, but "fact sheet" exercises, muddiest point, correlations between the numbers of times a subject was covered and the mastery level shown of the subject, periodic teaching evaluations during the semester, weekly quizzes, periodic exams, case studies, use of national databases, computer simulations, exercises, and programs, and field trips and reports were all related as useful tools for assessing student outcomes. From the diversity of assessment activities, it is apparent that the combined faculty of the School have adopted assessment as an activity by which they can

improve their courses, hence student leaning. Numerous adjustments were made during the year in course instruction as indicated by assessment activities. Course changes in the future were also noted by many instructors as a direct effect of assessment activities in 2008-2009.