RUTGERS
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2013 SOIL ECOLOGY SOCIETY MEETING

Soil
Ecology
Society

RUTGERS UNIVERSITY, CAMDEN CAMPUS
JUNE 11-14 2013

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Soil Ecology Society 14th Biennial Meeting, Camden New Jersey

Oral Presentation Schedule

Tuesday Afternoon, June 11, 2013

Session I — **Teaching Soil Ecology** **(MPR left)**

1:00 **Whence comes the Millennial soil ecology student, and what to do about the taxonomy thing?**
Mac A. Callaham, Jr., and David R. Coyle

1:20 **Problem-Based Learning from a graduate student's perspective**
Angela R. Possinger and José A. Amador

1:40 **Studio Soils: Student performance and perspectives in a newly restructured introductory soil science course**
Sarah E. Andrews and Serita D. Frey

2:00 **Discussion**

2:35 **Break**

2:55 **High-impact teaching practices in soil ecology: examples from K-12 and higher ed**
V. Bala Chaudhary

3:15 **Helping new gardeners understand Arizona soils**
Karl A. Wyant

3:35 **Designing soil biodiversity zoo exhibits enhances student learning about soil ecology and biodiversity**
Loren B. Byrne

3:55 **Discussion**

Studio Soils: Student performance and perspectives in a newly restructured introductory soil science course

Sarah E. Andrews and Serita D. Frey

University of New Hampshire, Department of Natural Resources and the Environment, Durham, NH

Engaging students in active learning by encouraging them to interact with their instructors, their peers, and the material can improve student learning outcomes. While a number of studies have examined the integration of active learning strategies into lectures, these have primarily been in physics, chemistry, and biology. We studied student performance in a soil science course before and after transition from a traditional lecture/lab structure to a 'studio' environment. In the studio course, lectures were minimized and integrated with collaborative group activities, lab work, and field days. Fail rate and average grades (quizzes, exams, research reports, final grades) were calculated before and after transition. In addition to testing for differences due to course structure, we also included gender, class rank, and GPA in our analysis. In the second studio year, 21 students (12 women, 9 men) were interviewed to gain a better understanding of students' perspectives on the studio structure as a learning environment.

Studio students consistently outperformed lecture/lab students across all assessment types; in addition, no studio students failed the studio course (compared to 3% in the lecture/lab), and the percentage of students whose final grade was lower than a C dropped from 17% (lecture/lab) to 3.5% (studio). Regardless of course structure, female students outperformed male students, sophomores outperformed upperclassmen, and GPA was a significant predictor of final grade. While students had mixed feelings about the proportion of lectures to group work, most interviewed students found the studio structure beneficial as a learning environment because they experienced more field and lab work, exchanged more ideas with their peers, and attended 'lecture' and 'lab' in the same class session (and thus could more readily make connections between the two). Overall, our findings suggest that the studio structure is an effective learning environment for an introductory soil science course.

Teaching Soil Ecology Oral Presentation

Designing soil biodiversity zoo exhibits enhances student learning about soil ecology and biodiversity

Loren B. Byrne

Roger Williams University, Bristol, RI

Soils contain high levels of biodiversity and lots of wild, funky creatures, but soil organisms “get no respect” among the general public. In an undergraduate soil ecology class, a project was developed that presented students with an opportunity to solve this problem. The students were charged with revealing the wonders of soil life to people by creating plans for a set of zoo exhibits that feature soil organisms. The project challenged students to use their knowledge of soil biodiversity, coupled with their creativity and science communication skills, to develop meaningful, good-looking and engaging zoo exhibit plans that would help educate people about the wonders of soil biodiversity. For the project, students were tasked with writing a marketing proposal (to “sell” their ideas), creating exhibit plans (including layout, specifications and signs), and articulating zookeeper instructions (for keeping the organisms alive and help them reproduce). To ensure a breadth of taxonomic representation in each project, minimum requirements were given about how many different taxa had to be included (e.g., at least one microbe, insect, myriapod, annelid, etc.). In addition, students were encouraged to integrate general ecological concepts into their exhibits and interpretive signs (e.g., mutualism, decomposition, ecosystem services). Students presented their projects to their peers who rated them and voted on a favorite. Overall, the students had fun with this assignment and exhibited sophisticated and creative integration of ecological and biological information in their designs. Many were able to explain scientific concepts in more general ways that would help zoo visitors understand the ecology and biology of soil organisms. Some students went beyond the minimum requirements and integrated soil physical and chemical information into their exhibit designs. Based on the student performance, this project is recommended for use as a rich, problem-based learning activity that enhances student knowledge of soil ecology and biodiversity and improves their skills for communicating science to diverse audiences.

Teaching Soil Ecology Oral Presentation

Whence comes the Millennial soil ecology student, and what to do about the taxonomy thing?

Mac A. Callaham, Jr.[1], and David R. Coyle[2]

[1]Center for Forest Disturbance Science, USDA Forest Service, Southern Research Station, Athens, GA

[2]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

We instructed a graduate-level course entitled Soil Biology and Ecology during the spring semester of 2013 at the University of Georgia. One unexpected feature of this experience was the highly diverse academic backgrounds among the students enrolled in the course. Although the course has historically been structured to include a good deal of “review” material on basic soil science (chemistry, horizonation, soil classification, etc.), we did not anticipate the need to review basic principles of biology. However, when discussing different soil fauna groups, it became apparent that several of the students had very little background knowledge of invertebrate biology or taxonomy, and thus were not prepared to assimilate in-depth information on the classification and identification of soil organisms - one of the stated objectives of the course. Interestingly, most students were comfortable and conversant in discussions of molecular techniques and approaches to assessing diversity, but some had difficulty relating the results from molecular data analyses to actual organisms. We used results from student exit interviews to develop a strategy for addressing the issue of how to teach animal taxonomy and specimen identification, and specifically have plans to incorporate an introductory lecture on taxonomy as a discipline, and give a broad overview of all the groups that will be covered in the course. In spite of the obstacles we encountered, the students still made great progress as measured by a pre- and post-course knowledge assessment, with students scoring an average 32% higher on this assessment at the end of the class relative to their scores on the first day of class. It remains to be seen whether our observations represent a trend in the type of student enrolled in the course, or if this was a peculiar attribute of the 2013 enrollees.

Teaching Soil Ecology Oral Presentation

High-impact teaching practices in soil ecology: examples from K-12 and higher ed

V. Bala Chaudhary

Environmental Science Department, Loyola University, Chicago IL

As the prevalence and scale of online instruction increases, the role of face-to-face education will increasingly shift to integrate traditional curriculum with high-impact educational experiences such as learning communities, collaborative assignments, service-learning, and research. The incorporation of such practices extends naturally into soil ecology instruction because of the accessibility and ubiquity of soil. I describe two inquiry-based activities that can be incorporated into a variety of environmental science or biology courses at the K-12 or college level. The first activity introduces K-12 students to mycorrhizal symbioses by comparing plants that are grown in either living or dead (i.e. sterilized) soil. Natural soil is collected during a field trip to a local park and used in a growth experiment of either mycorrhizal hosts (e.g. corn, marigold) or non-mycorrhizal plants (e.g. broccoli). The cumulative data collected by the entire class is used to determine whether or not plants grow differently when inoculated with living soil organisms including mycorrhizal fungi. Students gain an appreciation for the influence of soil organisms on plant growth, as well as integrate environmental and mathematical problem-solving skills, apply basic mathematics within life science contexts, hone skills in scientific investigation, and develop communication skills to convey scientific concepts. In the second activity, college students investigate erosion and soil loss by measuring soil stability with an in-field slake test. During a field trip to a local urban garden, soil peds from different locations (e.g. vegetated plots, compost, fallow beds) are tested for their ability to maintain structural integrity when immersed in water. Students gain an appreciation for the biological processes required for soil stability, the human impacts that lead to erosion, and the social motivations behind soil conservation. Benefits and challenges to incorporating high-impact teaching experiences into soil ecology instruction are discussed.

Teaching Soil Ecology Oral Presentation

Problem-Based Learning from a graduate student's perspective

Angela R. Possinger and José A. Amador

University of Rhode Island, Laboratory of Soil Ecology and Microbiology, Department of Natural Resources Science, Kingston, RI, USA

Problem-Based Learning (PBL) courses, which involve self-directed and group-facilitated learning, differ from traditional lecture-based courses in terms of focus on critical thinking, problem solving, assessments, and development of communication and interpersonal skills. PBL is distinguished by several components: (1) development of learning objectives for a particular unit by the instructor; (2) presentation of a problem in the context of a real-life or a plausible scenario to permanent groups that incorporates these learning objectives; (3) identification of previous applicable knowledge; (4) listing additional information needed to address the question; (5) acquisition of additional knowledge needed by the students; and (6) synthesis of previous knowledge and new findings to arrive at a solution to the problem, presented in both oral and written form. For instance, in courses in soil microbiology and soil-water chemistry, a soil contamination-themed problem may involve synthesis of relevant soil ecological concepts and site data to develop a remediation strategy, reflecting environmental consulting on a professional level. Some of the benefits associated with the PBL approach include improved retention of content, stimulation of discussion, and integration of both textbook-derived information and research literature for the support of conclusions and arguments. However, PBL-based courses may require a higher level of maturity and intellectual curiosity of students than in a traditional lecture setting.

Teaching Soil Ecology Oral Presentation

Helping new gardeners understand Arizona soils.

Karl A. Wyant[1,2]

[1]School of Life Sciences, Arizona State University, Tempe, AZ

[2]University of Arizona - Cooperative Extension - Master Gardener Program - Maricopa County

Working with the local community has always been an important part of my professional development. As a certified Master Gardener with the University of Arizona - Cooperative Extension, I design and present soil education workshops. This type of interaction is unique as it gives me face to face time with a segment of the population that are often missed by grant outreach activities and the traditional classroom setting.

The goal of this workshop is to help new gardeners, typically frustrated Mid-westerners, understand desert soils and their unique properties. You would be surprised at how many new gardeners lime their basic soils in Phoenix because it is what they did 'back home'. Yikes! My aim is to provide a remedy to the assertion that Arizona soils are impossible to grow plants in. As we say down here, "Gardening in the desert is not hard, it is just different"!

My workshop uses a variety of hands-on exhibits and visual aids to help convey the properties of a typical Aridisol. For example, I contrast an Arizona soil with a Mollisol or Alfisol from 'back East' so folks can get a visual appreciation for the vast change in soil types. I also show the various components of soil structure and how compaction/tillage may affect gardening success. I have exhibits describing the unique properties of local soils (e.g., basic pH, caliche, low organic matter, fauna, nutrient concentrations, etc.). Lastly, I provide further reading by handing out gardening and soil specific articles published by the University of Arizona - Cooperative Extension. My workshop has been well received and I think it is a great stepping-stone to help new residents (or old!) understand their local soil properties, which are so critical for gardening success.

Teaching Soil Ecology Oral Presentation