



## **11th RESOURCES FOR ECOLOGY EDUCATION - FAIR AND SHARE (REEFS)**

**ESA Annual Meeting, Louisville, Kentucky  
Sunday, August 11, 2019, 12:00 PM - 5:00 PM**

*The presentations are organized into three (3) rounds.  
Please **SELECT ONE (1)** presentation from each round. Each round includes 15 minutes of presentation time and 10 minutes for Q&A or feedback.  
Presenters will have copies of the lesson ideas available.*

### **ROUND 1**

#### **1. Speed dating for inquiry projects**

**Susan Arlidge**

**Biogeoscience Institute, University of Calgary**

After initial brainstorming and first data collection, students face their peers and have two minutes to describe each aspect of their project - their peers record what they are hearing. After two minutes, the partners switch. Each participant takes their own sheet, but the others do the recording. It's a great quick way to have students articulate their ideas and get project feedback from multiple sources early in an inquiry process.

*Vision and Change Core Concepts:* Pathways and transformations of energy and matter

*Vision and Change Core Competencies:* Apply the process of Science, tap into the disciplinary nature of science

*Status of Activity:* Newly developed, implemented once or twice in a classroom, lecture or laboratory

Page Break

## **2. Exploring Soil Diversity**

**J. Megan Steinweg**

**Biology, Roanoke College**

The exploring soil biodiversity experiment is utilized in a non-lab introductory biology course for majors as an introduction to experimental design at the beginning of the semester. The experiment focuses on soils that can be found on campus and factors that might influence the abundance and richness of bacteria, fungi, and nematodes. Students are given a handout that contains information about the different soil environments being tested and they develop a hypothesis from that information. Soils are collected and students perform three techniques to assess microbial diversity. Students are then guided through data analysis and presentation. The focus of this experiment is to help students understand the themes of biodiversity and systems, and practice quantitative reasoning.

*Vision and Change Core Concepts:* Evolution, System: living systems interconnected and interacting

*Vision and Change Core Competencies:* Apply the process of Science, Use quantitative reasoning

*Status of Activity:* Newly developed, implemented once or twice in a classroom, lecture or laboratory

## **3. Reflective essay for intensive field schools - building critical thinkers**

**Suzie Lavallee**

**Forest and Conservation Sciences, University of British Columbia**

As an exit exercise for a capstone course, students are asked to write an essay to reflect on their experiences and how it has built their skills and changed their understanding. General criteria are provided to the students, who then select learning objectives and experiences to illustrate significant moments of change for them. Students are strongly encouraged to connect to ideas from other courses in their undergraduate education and are instructed to write in prose, using a personal voice and not scientific writing. The core concepts and competencies that are most often chosen and reflected on by students are selected in the lists below.

*Vision and Change Core Concepts:* System: living systems interconnected and interacting

*Vision and Change Core Competencies:* Apply the process of Science, Tap into the disciplinary nature of science, Understand the relationship between Science and Society

*Status of Activity:* Newly developed, implemented once or twice in a classroom, lecture or laboratory

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**ROUND 2**

#### **4. Integrating the modeling of ecological cycles and energy flow**

**Vikki L Rodgers**

**Math & Science, Babson College**

This in-class activity challenges students to create and then integrate models of how carbon, nitrogen, water and energy all move within an ecosystem. Students are assigned one of these 4 models. Using 15 provided standard pools, they work independently to decide which pools are appropriate to include and then draw the fluxes that connect them. The jigsaw technique is used to critically evaluate individual models to create an agreed upon group model. Then by creating new integrated groups of 4, the students must integrate their models. Students decide the major human activities that are changing these ecological cycles and layer these on top. This activity is appropriate for majors and non-majors and can be adapted for use with white boards, index cards or worksheets. The full 4DEE framework can be addressed by adding a discussion of ecological practices used to measure these pools and fluxes.

*Vision and Change Core Concepts:* Information flow, exchange, and storage, Pathways and transformations of energy and matter, System: living systems interconnected and interacting

*Vision and Change Core Competencies:* Understand the relationship between Science and Society, Use modeling and simulation

*Status of Activity:* Newly developed, implemented once or twice in a classroom, lecture or laboratory

#### **5. Talking to the Trees**

**Dawn Lemke**

**BES, Alabama A&M University**

The integration of contemplative learning in higher education has a strong foundation in liberal arts and in face to face teaching. The value in connecting students to the material, each other and strengthening their over academic success with contemplative practices have been shown in many studies. Bringing this into sciences and online learning environments are less common. This is a discussion of a learning practice developed for a second-year online Ecology course at Alabama A&M University, a land-grant HBCU. The Ecology course is taken as an option for Biology Majors and required for Education Majors looking to teach biological sciences in high school. The objective of the practice is to bring students a connection to their environment and expose them to different learning and teaching methods.

*Vision and Change Core Concepts:* System: living systems interconnected and interacting

*Vision and Change Core Competencies:* Tap into the disciplinary nature of science, Understand the relationship between Science and Society

*Status of Activity:* Newly developed, implemented once or twice in a classroom, lecture or laboratory

#### **6. Evolution by Natural Selection (An Active Learning Lecture)**

**Justin St. Juliana**

## **Ecology and Evolutionary Biology, Cornell University**

I will present materials for a lecture in which students explore evolution by natural selection through a series of active learning events. Students work in groups and spend approximately 60% of their time as active participants during the 50 min. lecture. This active lecture is representative of active lectures that we have developed for many subjects that cover an entire semester of a majors & non-majors intro ecology course.

*Vision and Change Core Concepts:* Evolution, Information flow, exchange, and storage, System: living systems interconnected and interacting

*Vision and Change Core Competencies:* Use modeling and simulation, Use quantitative reasoning

*Status of Activity:* Highly developed, implemented multiple times in a classroom, lecture or laboratory

## **ROUND 3**

### **7. Body Continuum Polling: A Dynamic Technique for Any Classroom**

**Erica S. Tietjen**

**School of Public Policy and Leadership, University of Nevada, Las Vegas**

Students in any course appreciate being asked to share their opinion on environmental and ecological issues, usually using technology made for audience participation (e.g. PollEverywhere, Kahoot), and designed to provide immediate feedback that can be seen by all participants. These methods are fast and effective, and have the added benefit of capturing group analytics, but they are constrained by technological requirements and are still potentially passive approaches in which all students may not be engaging. Body continuum polling is an active technique designed to engage students physically in the classroom space, by getting them move around the classroom to place themselves along a gradient (less to more, low to high, etc.) that spans the room. Students provide their opinion on a question or topic, combined with a kinesthetic approach that engages them with movement (Mobley & Fisher, 2014) and leads to subsequent classroom dialogue and discussion.

*Vision and Change Core Concepts:* System: living systems interconnected and interacting

*Vision and Change Core Competencies:* Understand the relationship between Science and Society

*Status of Activity:* Newly developed, implemented once or twice in a classroom, lecture or laboratory

### **8. Developing a class consensus nursery management plan**

**Tracy Gartner**

**Environmental Science, Biology, Carthage College**

In this semester-long project, students observe the full life-cycle of greenhouse-grown mustard plants from germination to full flower and fruit setting. They keep a journal-style lab notebook to document

their observations of the plants grown under two different treatment conditions. Each student group is responsible for different variables selected by the class based on background readings focused on ecological importance of light, soil, water, companion crops, etc. Students take measurements of basic plant metrics as appropriate; subsets of these plants also are destructively harvested to examine basic physiology. Each student group will write a standard lab report documenting their findings, comparing their two growing methods. Student groups then share their reports and work together to develop a class consensus recommendation of best growing practices. This project incorporates all four dimensions of the 4DEE model and would be appropriate for botany and ecology classes at a variety of levels.

*Vision and Change Core Concepts:* Structure and function

*Vision and Change Core Competencies:* Apply the process of Science

*Status of Activity:* In development, has not been implemented in a classroom, lecture or laboratory.

## **9. Pinyon Dying**

**Jennifer Doherty**

**Biology, University of Washington**

Students investigate the mechanism for the massive Pinyon Pine die-off in the American Southwest due to climate change. Through this case study students learn about plant water and sugar transport by evaluating data, using system models and applying the physiological principles of flux and mass balance.

*Vision and Change Core Concepts:* Autecology

*Vision and Change Core Competencies:* Quantitative reasoning and computational thinking, Designing and critiquing investigations

*Status of Activity:* Highly developed, implemented multiple times in a classroom, lecture or laboratory.