7th Resources for Ecology Education Fair and Share (REEFS) Presentations

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Title: Materially Closed Ecological Systems; pollution effects on algae and grazers.
Description: Student teams decide which environmental stressor they want to test (e.g., pesticide, nutrient enrichment, temperature, sealed vs open to atmosphere) and set up ecological systems composed of inorganic nutrients, algae or algae-grazers (Daphnia) in 250 ml bottles. The controls are the same for all teams, but each team can test a different stressor. The bottles are sealed and observations of green color and the number of Daphnia are counted each week for 3 additional weeks. Conservation of mass (chemicals) and energy (light to heat), photosynthesis-respiration equations and the earth's O2-CO2 cycles should be discussed by the students using these bottles as analogs of the earth's biosphere. Replicates allow students to observe biological variability. These experiments have been used extensively by independent research students, but yet to be tested as a class activity. It needs to be tested with commercially available resources instead of my laboratory's solutions and cultures.

Indicate to what extent this learning is developed: Highly developed, implemented multiple times in a classroom, lecture or laboratory

Page Break

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Title: Birds, trees, noise, and your local community.
Description: Non-majors biology courses are often used as an overview of the various fields of biology. While this method allows students to become familiar with terms and processes used in ecology, longer-term retention of these concepts is challenging. The overarching goal of this multi-week project is to learn biology by doing biology. The specific project goals are; 1) to engage students in real-world ecological research, 2) to make connections with local ecological organizations, and 3) to increase student's familiarity with ecological processes on accessible, local nature preserves. Encompassed within these goals is the opportunity for students to learn to identify local bird and tree species, utilize field data collection methodologies and equipment, and practice sound data recording and reporting procedures. Ultimately, students are given a tool set that equips them for a lifelong appreciation of the natural world found within their communities while contributing valuable ecological data to local conservation groups.

Indicate to what extent this learning is developed: Newly developed, implemented once or twice in a classroom, lecture or laboratory

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Title: A Simple Demonstration of Island Biogeography Theory's Mechanisms and Predictions
Description: Although Island Biogeography Theory is a classic ecological concept, its somewhat abstract nature may make it challenging for some students to construct mental models about its predictions and the mechanisms underlying them. To help ameliorate this, a classroom demonstration was created to illustrate the theory's multiple dimensions. Different colored ping-pong balls represent individuals of different species, and several cloth sheets of different sizes represent islands. The demonstration's goal is for students to "colonize" the islands with individuals in a given amount of time, by throwing the balls from one side of the room onto islands placed at varied distances from them. Data about species richness and population sizes on the islands can be tallied for several "colonization" iterations to serve as focal points for examining relationships among the island and species variables. Follow-up discussions can refer back to this concrete demonstration to reinforce and extend students' understanding of the theory.

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Page Break

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Title: Quantitative Undergraduate Biology Education and Synthesis (QUBES) project
Description: Although many excellent teaching materials are available, they are scattered among many different repositories, making them difficult for instructors to find. The NSF-funded Quantitative Undergraduate Biology Education and Synthesis (QUBES) project aims to promote exchange of ideas and teaching materials among faculty, and to encourage them to incorporate more quantitative content into their biology courses. Rather than focusing on a classroom activity, our presentation will cover the range of classroom materials available on the QUBES website (qubeshub.org) and how to find these materials. We will also discuss how workshop participants can add their own modules or activities to the QUBES website, in order to encourage their dissemination and adoption. Finally, we will present the QUBES faculty mentoring networks, which are designed to provide faculty with more intensive support for adopting new classroom materials, while at the same time connecting them with others who have similar interests.

Indicate to what extent this learning is developed: In development, has not been implemented in a classroom, lecture or laboratory

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Title: Multimedia Resources for a Case Study in Ecology: Gorongosa National Park
Description: Gorongosa National Park in Mozambique experienced large-scale wildlife loss during the country's civil war. Today scientists work to restore the park's ecosystems using cutting-edge conservation practices. Explore online, multimedia resources, which show geographic and time-related data from the park for classroom use.

Indicate to what extent this learning is developed: Newly developed, implemented once or twice in a classroom, lecture or laboratory

Page Break

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Title: Creating Food Chains and Webs to Model Ecological Relationships
Description: We developed this hands-on activity as part of a suite of resources using Gorongosa National Park in Mozambique as a case study in ecology. Students identify the roles of producers and consumers in the Gorongosa ecosystem then create a food chain to show the flow of energy in that system. They then introduce an ecological disturbance and predict how the energy flow will be

impacted. Lastly, students will represent a more complex flow of energy through multiple relationships in a food web and again make a prediction when an ecological force is introduced.

Indicate to what extent this learning is developed: Newly developed, implemented once or twice in a classroom, lecture or laboratory

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Title: Getting students' hands dirty: self-directed field trips and collaborative data analysis
Description: In classroom-based courses, students often do not get their hands dirty outside. This simple activity gives students the opportunity to participate in field data collection and statistical and spatial analyses of the data they collected. Students are engaged in this activity as the field data collection is fun, and they have ownership of their data and contribution to the project. From this activity, students learn the following skills: data collection, critical thinking, collaboration, basic statistics, geospatial analysis and Excel. There are three parts: 1) Data Collection and Field Trip - Students visit field sites where they are asked to observe and count species, and record geomorphological features and ecosystems. 2) Data Processing - Students input their records into an Excel file. 3) Data Analysis - In a class setting, students input the entire class' collated data into an open-source GIS program such as QGIS and discuss possible patterns and correlations.

Indicate to what extent this learning is developed: Highly developed, implemented multiple times in a classroom, lecture or laboratory

Page Break

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Title: Designing an Urban Green Infrastructure Network: Balancing Biodiversity and Stakeholders
Description: Students pursuing environmental management careers will need to utilize transdisciplinary approaches to address management issues in socio-environmental systems. Educators can use urban wildlife issues as a hook to draw students in to explore larger questions about managing biodiversity in urban landscapes, restoration goals, and balancing ecological and social components of urban ecosystems. A case study designed through SESYNC's "Teaching Socio-Environmental Synthesis with Case Studies 2014" workshop addresses these objectives by putting students in the role of environmental managers charged with protecting species in urban landscapes. In groups, students design a green infrastructure network to conserve one species across parks and natural areas acting as hubs and corridors in a particular geography. They are

given a budget and incorporate stakeholder issues into their designs. Groups are then rearranged to contain one member of each original single species group. The multiple species groups redesign the network to protect all species simultaneously.

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