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An In-Class Role-Playing Activity to Foster Discussion and Deeper Understanding of Biodiversity and Ecological Webs

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Title

An in-class role-playing activity to explore biodiversity and create ecological web diagrams

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Abstract

In a general sense, biodiversity is an intuitively simple concept, referring to the variety of Earth's organisms. Ecologists, however, conceptualize biodiversity in a more nuanced, multidimensional way to reflect the enormous diversity of species, niches, and interspecific interactions that generate spatiotemporal complexity in communities. Students may not fully comprehend or appreciate this deeper meaning if they fail to recognize the full range of species in a community (e.g., the often-ignored microbes and small invertebrates) and how their varied interactions (e.g., mutualism, parasitism) and activities (e.g., ecosystem engineering) affect an ecosystem's emergent structure (e.g., food webs) and function (e.g., decomposition). To help students learn about biodiversity and complex ecological webs, a role-playing activity was developed in which students "become" a different species (or resource) that they investigated for homework. In class, students work in small groups to "meet" other species in their community and, as appropriate for their roles, "consume" or "interact" with each other. As they make intraspecific connections, students collectively create an ecological web diagram to reveal the structure of their community's relationships. This diagram is used for further exploration and discussion about, e.g., trophic cascades, non-trophic interactions, ecosystem engineering, and species' effects on the movement of energy and nutrients. This inquiry-based activity has been observed to sustain student engagement and yield productive discussions and positive responses. Further, qualitative assessment indicates that students' knowledge about biodiversity and ecological interactions improves after the activity and discussions, suggesting that students benefit from acting in and constructing their own ecological webs.

Introduction

Biodiversity and interspecific interactions are cornerstone concepts of ecology that should be understood by everyone; they underpin important environmental issues, especially the ecosystem services that generate natural resources and conditions that benefit humans (MEA 2005). For most people, biodiversity likely has generic colloquial meaning, such as variation among species and ecosystems (Freeman 2011). Similarly, when asked about relationships between species, most people would probably describe well-known food web interactions such as those between predators and prey. However, fewer people may appreciate the full range of life and species interactions, having little if any awareness about the enormous diversity of ubiquitous and ecologically important organisms (e.g., bacteria, fungi, protozoans, nematodes, and small arthropods) and their diverse types of direct and indirect relationships (e.g., mutualism, ecosystem engineering) that are important for affecting community structure and ecosystem functioning (e.g.., Sonia et al. 2012). In addition, a fuller conceptualization of biodiversity, as emphasized by ecologists, integrates other aspects of life, including diversity of higher taxonomic groups (e.g., kingdoms, phyla, etc.), the many habitats in ecosystems (e.g., soils; Brussard et al. 1997), ways of acquiring energy, and life cycles, all of which may be little understood by most people (Zeigler 2007). A key challenge for ecological educators is to help students move past the elementary understanding of biodiversity and simple food-web interactions toward a holistic, multifaceted and more complex conceptualization of them. In this article, the phrase "ecological webs" will be used to refer to the full range of all species in communities and their diverse interactions that include, but is much broader than, food web relationships (Sonia et al. 2012).

A key pedagogical strategy for helping students develop deeper understanding of concepts is to employ active student-centered learning methods in which students are guided to examine their current knowledge, expose gaps and misconceptions, and then use new information to improve understanding (e.g., NRC 2000, Brooks and Brooks 2001, Weimer 2002). In practice, this means moving beyond lecturing as a primary means of conveying information and developing hands-on and, thus, minds-on learning activities in which students take more responsibility for exploring content directly; personal engagement in the lesson is a catalyst for constructing personal frameworks for knowledge. In this context, a learning activity was developed that helps students explore ecological webs in a way that will potentially deepen their appreciation for little-known organisms and the multitude of trophic and non-trophic interactions that connect them.

Briefly, the learning activity asks students to collect some basic information (via an internet search) about an organism (or resource) and its relationship to other species. Then, in class students are asked to "become" their assigned organism in a role-playing exercise in which they interact with other students (who represent different species) to establish interspecific relationships. Using these relationships, students create a diagram of an ecological web to reveal the structure of their community. The diagram is then used as a focal point for discussing many aspects of ecological webs, such as the dynamics that occur due to changes in them (e.g., trophic cascades), and how energy and nutrients move through them.

The specific details of the activity are very flexible and open-ended which allows instructors to tailor them to meet their specific instructional and students' needs (e.g., using different community composition and discussion questions, creating groups of different sizes for classes of different sizes). The activity was originally developed for a small upper-level soil ecology undergraduate course at a large public university. Since then it has been used for five years in undergraduate courses at a small liberal arts university with science majors in an introductory ecology course and with non-majors in a general education science course. All these courses have had enrollments of ~30 students that were divided into two groups for the activity. The activity has also been used by colleagues for a graduate-level soil ecology course and an introductory biology course at a community college. In all these courses, instructors and students have had positive responses and evidence has been observed to indicate that students met the learning outcomes listed below.

Learning outcomes

The activity described below was designed for a course unit on community ecology to help students deepen their awareness and understanding of biodiversity, intraspecific interactions, and their effects on community structure and dynamics. Introductory lessons about these topics (that included overviews of all key words) were provided before the activity to help students scaffold information included in the activity and more successfully meet achieve the learning outcomes. (Instructors are encouraged to refer to introductory textbooks and cited references for information, including keyword definitions, which can be used to create introductory lessons.)

Following the role-playing activity, ecological web creation, and follow-up discussions, students should be able to:

- Identify a fuller range of taxonomic and organismal diversity within communities (i.e., more than just plants and large animals)
- Correctly name and describe the interspecific (including trophic) relationships for a diverse group of organisms in a focal community
- Explain patterns in and processes affecting the structure and dynamics of a community
- Predict how ecological changes or human activities might influence the structure and dynamics of a community (e.g., a trophic cascade)
- *Optional advanced extension:* Describe how interspecific interactions affect the movement of matter and energy through an ecological web

In addition to these content outcomes, the activities may help students improve their interpersonal communication and team-work skills because it asks them to talk and work in small groups to complete a task.

Timeframe

Instructor preparation: approximately 30 minutes (estimated, may vary with class size and instructor's interest in creating novel and/or specific ecological webs for the role playing)

Estimated class time: 20 to 30 minutes (or more depending on desired discussion length and depth)

List of materials

- A notecard for each student (with at least one blank side without lines)
- Tape
- Markers (3-4 per student group)
- Large sheet of paper, approximately 2m X 1m (or classroom board)
- Optional for advanced extension: Piece of wrapped candy (e.g., mint, chocolate) for each student
- Students will need access to the internet to complete the homework assignment

Procedure and general instructions for instructor

The instructor should first determine the structure of the ecological web to be focused on in the activity which will determine the students' assigned roles (and guide, but perhaps not determine, the web diagram that they produce). The instructor can choose any community of interest (e.g., one that s/he is familiar with, that will be novel for the students, or that complements other course lessons), but it should include a wide diversity of species and interspecific interactions, including those across higher trophic levels, and as desired, non-trophic relationships such as mutualism. In addition, the diversity of non-living biotic (e.g., detritus) and abiotic (e.g., nitrate molecule) resources used by organisms in a community can be incorporated for some student roles (see examples in Box 1). An additional recommendation is to choose a community in which many interesting, unusual, lesser-known, underappreciated, and/or misunderstood species and interactions can be identified, i.e., ones that will be wholly or partially unfamiliar to students (e.g., soils, Brussaard et al. 1997; see Box 1). This will help students learn about the full range of biodiversity and make their homework and the role-playing activity more engaging and rewarding. (In contrast, using a familiar community with many recognizable species such as the large mammals on the African savannah may be too predictable and not support the learning outcomes as well. However, using this community as a focus but integrating less-well-known species such as soil bacteria and invertebrates could help students appreciate these components of biodiversity.)

For the chosen focal community, the instructor generates a list of its species (or higher taxonomic groups as preferred; hereafter "species" for simplicity) and resources, each of which will be assigned to a student (Box 1). The number of species and resources needed is determined by the number of students in each "community." Based on previous experiences, 12-15 students per group works well; however, instructors should experiment with other sizes as needed for their classes, personalized learning outcomes, and ecological webs of interest (i.e., larger groups if a focal community has more species).

With careful planning, instructors can prepare a wide range of personalized learning outcomes through modifying their communities. To facilitate this, the instructor can draw "test" web diagrams with the chosen species and resources. As needed, the list should be revised to ensure 1) that all species and resources have at least one connection within the web, 2) to simplify web complexity, or 3) limit the number of possible relationships. Further, as confusing or ambiguous relationships are identified, more descriptive (e.g., taxonomic or trophic) information can be given for each species and resource (which may be needed for students to perform more successful online searches for their assigned role; see below). (For example, in Box 1, both bactivorous and fungivorous nematodes are listed and two taxonomic groups of mites are identified.) Such details can be used to create a longer list of species and resources to use. Thus, lists with slight variations can be created so that each student group receives a different list and will create a unique web; differences can be intentionally created to facilitate valuable follow-up discussions. (Box 1 provides a tested example for trying the activity without the need for additional preparation.)

Once the species/resource list is finalized and the number of student groups is identified, the instructor prepares the notecards that are given to the students to assign each a community "role" and provide a place for completing the homework assignment. On the blank side of the card, the instructor writes the species/resource name at the very top or bottom, and, if needed, a group identifying code in the corner (e.g., A, B, etc.; Fig. 1). For smaller classes (e.g., $\leq$30 students), this step is quick and easy to complete by hand. However, with larger classes, instructors may wish to type and print "cards" on office paper and cut them to size. (In this case, the prompts for the information that students are to provide for homework on the second side (as shown in Fig. 1) can be prepared also, provided the printing is done as double-sided. When the species/resource names are hand-written, this requested information can be presented to students on a PowerPoint slide or a classroom board.)

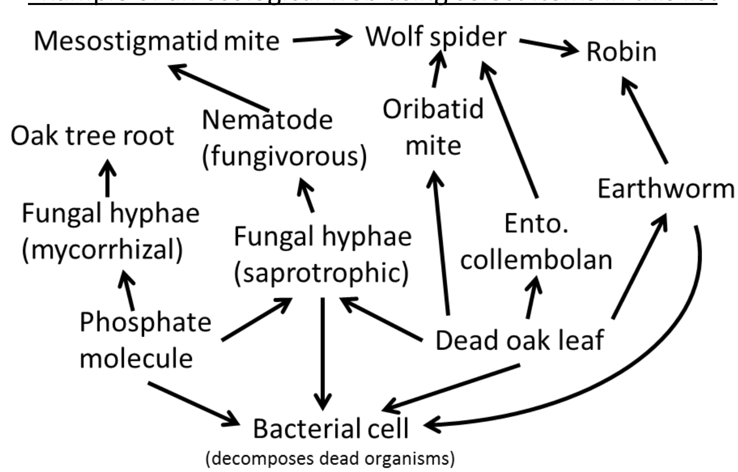
The preparation described above should be completed before the class meeting immediately prior to the one during which the role-playing activity is to take place. This allows for the note cards to be passed out to students during this class so they can investigate the biology and ecological relationships of their assigned species/resource for homework. More specifically, students are asked to conduct an internet search for images and articles about their role and then provide a drawing and information on their notecard (Fig. 2). (See "instructions for students" section below for details.) When the homework assignment is given, it is recommended that instructors tell students that they "must" complete (i.e., will be held responsible for completing) this assignment for a group activity to work "correctly" during the next class (i.e., group work as motivator).

Box 1. An example community and species/resource list for the ecological web role playing activity. The role-playing activity was originally designed for a soil ecology course and the author (who is a soil ecologist) has continued to use soil biodiversity as focus for other courses. Because soil biodiversity contains organisms from many diverse taxa across the domains and kingdoms of life that are often not well-known by students, it provides an engaging focus for this activity and helps students learn about an important ecological habitat. Thus, a soil-detritus ecological web from a deciduous forest is used here to illustrate a species/resource list and "preview" of a possible student-generated ecological web. The list contains more species than in the simplified web to provide additional options that could be included the activity. In the web, arrows indicate the flow of energy from prey (or resource) to the consumer. (Note: in the list, higher, more general taxonomic groups than species are named; this may be more appropriate for introductory students. Individual instructors can decide what level of taxonomic resolution to use depending on their specific course context.) (For more information on soil food webs, see SWCS (2000).)

List of resources and species

- Dead oak leaf
- Deer dung
- Fungal hyphae (saprotrophic)
- Oak tree root
- Nematode (fungivorous)
- Oribatid mite
- Millipede
- Wolf spider
- Robin
- Bacterial cell
- Phosphate molecule
- Fungal hyphae (mycorrhizal)
- Nematode (bactivorous)
- Entomobryomorphan collembolan
- Mesostigmatid mite
- Earthworm
- Centipede
- Beetle larvae (carnivorous)

Example of an ecological web using select items in this list



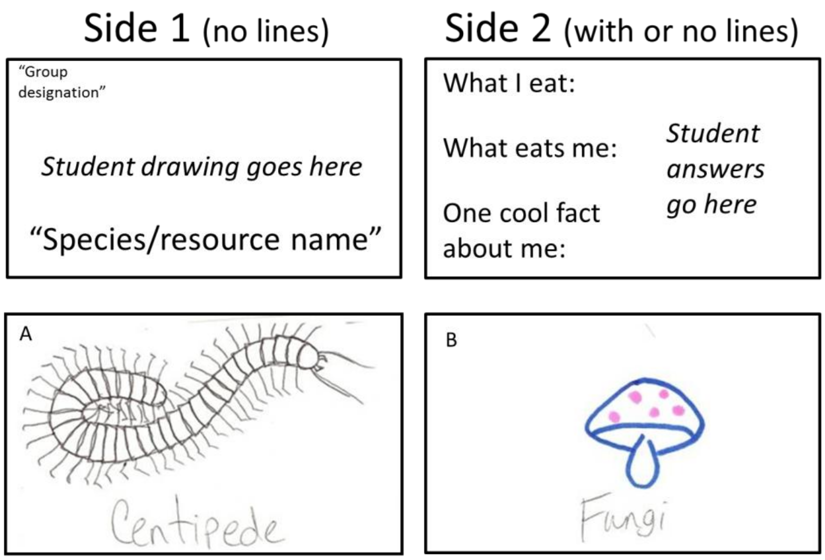


Figure 1. Overview of placement of information on cards (top row) and examples of student drawings of assigned organisms (bottom row). See text for further information.

Prior to the class when the activity will take place, instructors should prepare materials needed for students to create webs in the classroom. This can be done in at least two different ways. The student notecards can be taped to a large (~2 m wide by 1 m high) sheet of paper or a chalk/dry-erase board. If the former is used, dark markers (three or four to allow multiple students to work simultaneously) will be needed to draw ecological connections among notecards; for the latter, chalk or dry erase markers can be used. (A note of caution: when using a dry erase board, check how well the tape adheres to it before the activity.) To help guide the students' arrangement of their notecards into meaningful and visually clear ecological webs, the instructor could provide some general sections or notes on the paper or boards. (For example, for the soil-detritus web of Box 1, a line can be made to designate the soil surface which helps students place their cards relative to where their organisms live: above, on, or in the soil.) In addition to these required items, instructors who wish to include the optional, more advanced exploration of the movement of energy and matter through ecological webs (described below) will need to obtain one piece of individually wrapped candy (e.g., mints, Hershey's kisses) for each student.

At the beginning of the class with the activity, a more detailed introduction and instructions should be given to the students, including, and especially, the clear purpose and learning outcomes for the activity. (It has been observed that students respond more favorably when they know that this is not just a "silly" elementary activity but rather is meant to help them learn some sophisticated ecological information.) Instructors should tailor the content of this presentation to the level of their students and context of their course, and use a format following their preferred teaching style (i.e., oral or with visuals). In general however, the basic overview of the procedure and "flow" of the activity, explained below, should provide sufficient information to complete the activity. Following the introductory presentation, students should be invited to gather in their designated groups, establish their ecological relationships, and collectively create their diagrams. The instructor should move among the groups to encourage students to "interact", guide their diagram creation, and answer questions. Once the web diagrams have been completed, the whole class can be brought together to discuss what students learned and answers to instructor's questions (see Box 2 below).

To guide the role-playing interactions, students can be asked to imagine themselves as "becoming" their assigned organisms. In particular, they should think about what they need to eat and what organisms consume them. If appropriate for their role, they can be asked to consider any other resources or interactions they need to survive (e.g., plant roots for mycorrhizal fungi). While acting as their assigned organisms, they should interact with other organisms in their "community" and find the resources they need (Plate 1, Photo A). This interaction step can be framed in numerous ways, as described below. One ideal way has not been identified due to the variety of students' and class "personalities"—what works for one class, fails for another. In addition to adapting the following possibilities, instructors might wish to develop other more-or-less detailed, theatrical/acting-centered, and rule-based instructions for how students should act out their organisms' roles and establish ecological relationships within their webs.

One way to invite students to interact in their communities is to have them think of themselves as going to a "biodiversity cocktail party" where they "mingle" in smaller groups of 3-4 different "organisms." Through conversation, they learn about the biodiversity of the community and make ecological connections. Alternatively, students could be asked to play "20 questions" to discern who-is-who in the community; once a person's identity is guessed, an organism who wants to consume that organism can reveal herself followed by someone who wants to consume her and so on. Alternatively,

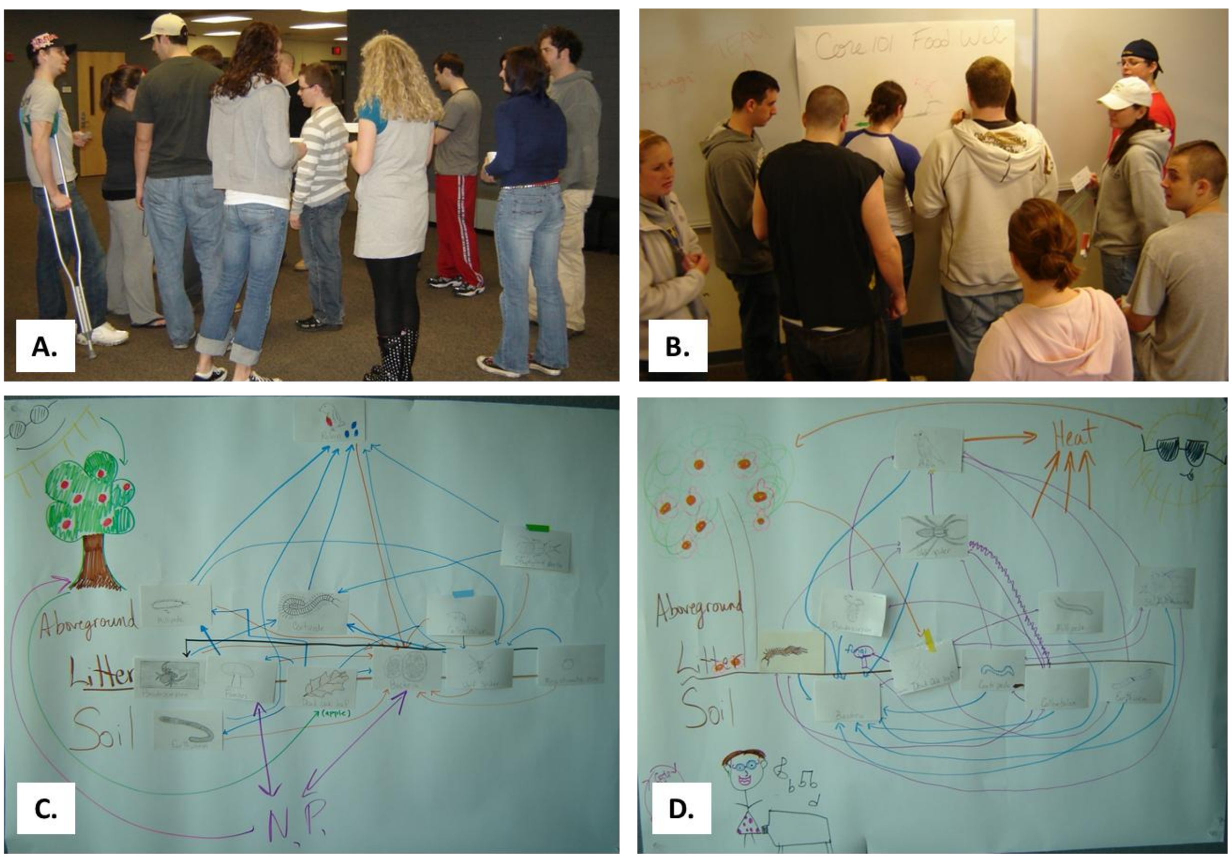


Plate 1. Photos from the role-playing ecological web activity. A) Students during the interaction activity when they establish ecological connections with each other. B) Following establishment of the ecological connections, students work together to create an ecological web diagram on a sheet of paper. C and D) Examples of student-generated ecological webs with the attached notecards on which they drew their assigned species for homework.

create a more competitive group dynamic, the interactions can be framed as a game in which the "last organism standing" who hasn't been eaten is the winner. To do this, students need to determine who is who in the community while not revealing their identities. This can be done by eavesdropping on other conversations or being "tricky," e.g., by concealing who they really are. For this approach to work, some rules probably need to be given so that students are required to establish relationships at some point and not just avoid interactions to "win". All three of these approaches have been observed to have strengths and weaknesses, but each can guide a group to complete their diagram.

As the activity begins, there is often a bit of hesitancy and awkwardness among students as they figure out what to do; they may need additional encouragement or instruction clarification to let down their guard and participate. At this point, patience is essential for the instructor because a few moments of awkward silence can give way to rich and productive student dialogue. (Often, at least a couple of students are bold enough to take the lead and start interacting.) Nonetheless, the instructor has a critical role here for closely watching the students as they begin, or fail, to interact and intervening as needed to ensure that they stay on task and do not become overly frustrated (e.g., if they are embarrassed or confused about what to do). Instructions may need to be revised or abandoned if they are impeding students' interactions and diagram creation. In the author's experience, sometimes the "frame" for the role playing has broken down as students begin making connections on their own without regard to provided instructions. This does not mean that the activity is failing because creating the web diagrams is the primary outcome. Given this, the instructions may not be critical, but, if they are presented well and followed, light-hearted moments can emerge as students try to "act" as their organisms and interact with each other in various, often creative, ways. To this end, students can be encouraged to be clever and have fun with the role-playing, even by being overly dramatic and really "getting into their characters". This may help students see past stereotypes about "science" being boring and uncreative.

During the activity, once a connection (or multiple connections at once) is made between two (or more) students, those "interacting" students should tape their notecards onto their group's web diagram and draw an arrow between them to illustrate an ecological relationship (Plate 1, Photos B, C and D). To ensure consistency among all interactions, they should be told whether to draw arrows pointing toward the consumer or consumed organism/resource. As the instructor desires, students could be asked to label the arrows with vocabulary terms that describe the relationship. Further, students should be reminded that their collective goal is to make a comprehensible diagram such that, when they place their interaction on the diagram, it should be done in a way that "makes sense" and allows connections to be made with other pairs (e.g., not too clustered). As more and more notecards (species) are added to the web, students can be asked to draw and label additional connections and add missing species and resources to make the diagram more complete. Further, the instructor can ask guiding questions to promote the addition of more detailed information (e.g., adding the sun as the ultimate source of energy, loss of energy via heat). It has been observed that some students take ownership and pride in their diagrams, with some enthusiastically adding other components. For example, one student drew a caricature of Elton John with his piano to highlight the relevance of his song "The Circle of Life" from the movie "The Lion King" to the web (see lower left of Photo D in Plate 1). This provided a nice bit of laughter for the class which created a positive climate in which students felt more comfortable asking questions and sharing reflections.

To extend the focus of these activities (which focus on biodiversity and interspecific interactions), a variation was developed that integrates the concept of energy and nutrient movement through ecological webs. To add this dimension, each student should be given an individually-wrapped piece of candy. Students can be told that this candy represents the energy and/or atoms/molecules (e.g., C, N, sugar, nitrate) that are contained in their organisms/resources. The general instruction is that students must give their candy to another student when they are "consumed" through the establishment of an ecological interaction. Students who lose their candy are "dead" and no longer able to interact in the community; those who have candy continue to establish connections and collect more candy. If desired, instructors can structure these interactions more carefully to illustrate how energy and nutrients move through food webs (e.g., loss of candy across trophic levels to represent heat lost as energy is transformed). Alternatively, it can be structured so that all nutrients are recycled through the community via decomposers (especially bacteria and fungi). Otherwise, these points can be brought forth through the follow-up discussion. Either way, inclusion of the candy has been observed to make the abstract ideas of energy and matter movement more concrete which can help students create stronger mental models about ecosystems.

A key benefit of student created ecological webs diagrams is that the diagrams provide a personalized focus for engaging the class in discussions about student insights and ecological content. The instructor can ask guiding questions about the diagrams to emphasize desired topics (Box 2). For example, to discuss trophic cascades, students can examine how populations in the web would change if a certain species or resource was removed (Pace et al. 1999). In a class with multiple student groups, the whole class can be brought back together after the diagrams are created, and similarities and differences between the webs can be analyzed. More generally, students can be asked what they specifically learned from the activity or their homework research about their roles. Because they were asked to find "cool facts" for homework (see Fig. 2 and "instructions for students" section), they should all be able to share interesting biological and ecological insights about all the species in the web; if the instructor provides an opportunity to share their findings, they can collectively generate a deeper sense about the meaning of "biodiversity" as different species' names and characteristics are revealed. Supporting this outcome is one of the motivations for asking students to draw their organisms on their cards; while in groups, students can actually see what (some of) the diversity of life looks like as ecological interactions emerge right before their eyes. Further, exposure to this biodiversity has been observed to foster great student-generated questions during the discussion session, especially when the organisms and community of their webs are unfamiliar to them. Overall then, the role-playing and diagram-generating activities described above foster a rich and rewarding student-learning experience.

Box 2. Example questions to guide the discussion session following the role-playing and web-creation activities. In addition to these possibilities, instructors are encouraged to develop their own questions that reflect their specific courses, students and learning objectives.

- What trophic level does each of these organisms occupy?
- In a real-world community, which of these organisms would be most abundant? Why?
- How do the interactions of this web affect the population sizes of each organism? What would happen if species X were removed? What would happen if species Y were added?
- Are there any non-trophic interactions in this web? How do they affect the trophic interactions?
- What is the ultimate fate of all organisms in this web when they die?
- What is the ultimate source of all energy in this web?
- What happens to energy as it flows through the web?
- What organisms in this web had you never heard of before? Why do you think that is?
- Are all organisms in this web essential?
- What benefits for humans (ecosystem services) emerge from these relationships?
- How could this community be connected to another one that is nearby?
- Why should anyone care about what happens to the species in this web?

Procedure and general instructions for students

Prior to the class period with the role-playing activity, students should complete a homework assignment for which they investigate their assigned species or resource. They should be given a notecard that contains the name of an assigned species or resource (Fig. 1). For homework, they should conduct an internet search of their organisms and read some basic information about them. In particular, they should look for images and information the supports the following steps. On the notecard, they should do four things:

1. Draw a quick but realistic sketch of the named organism or resource (on the blank side with the name).
2. Write a list of items or organisms that your organism eats.
3. Write a list of organisms that eats your organism.
4. Write one “cool fact” about the organism.

Alternatively, as shown in the text on side 2 of the card in Fig. 2 (upper right), these instructions can be written so as to encourage the role playing aspect of the activity, i.e., students are encouraged to think about themselves as the organism (“what eats you”). These four instructions can be presented orally to the class, or on a PowerPoint slide, or as a formal handout (which has not been used by the author and thus is not presented here). Alternatively, if a large number of the cards are to be prepared for a large class, the cards can be printed with these instructions on them as shown in Fig. 2.

Students should be clearly instructed that they need attend the next class and bring their notecards with them for the activity to work. If not enough students attend or bring their cards, it will be very difficult to create a valuable ecological web. To this end, students can be assigned “credit” or points for this homework assignment (and the class activities) as appropriate for a specific course’s syllabus and instructor’s desires.

At the beginning of the class period during which the activity will occur, students should be given a general and detailed overview of the procedures involved. These should be adapted from the text described in the previous section.

Suggestions for assessing student learning

When the author has used this activity, three associated assessment methods have been used (but not all three in every class), one formative and two summative.

1. Formative assessment: Pre- and post-minute papers

One way to assess student learning that is facilitated by the role-playing activity is to gauge student understanding of food webs (as a proxy for ecological webs) prior to and after students engage in the role playing activity. For this, students should be asked to provide short paragraph-style written responses (i.e., a minute paper) to the open-ended question “what is a food web?” This should first be done prior to any lessons or assignments about ecological relationships and food webs, including the role-playing activity. These answers should be saved so they can be compared to answers to the same question that are provided immediately following the role-playing activity (post assessment) (e.g., even during the same class period). (Alternatively, students can be asked more specifically, “what did you learn from this food web activity?” so they are thinking specifically about their experiences in it.) If desired and time permits, students could be asked to answer the question for a third time at a later date, e.g., two weeks later or on a final exam.

When this assessment approach was used in several classes, students' responses progressed from simplistic and uncertain to more nuanced and specific. Following the activity, they were able to provide more information about complex interconnections, diversity of species in a community, energy flow, and the way that one species can affect many others in a web. Some were also able to describe the scientific use of diagrams to models species relationships in communities to improve our understanding of them. Such feedback provides support for the use of the activity in class to promote student learning about biodiversity and community ecology.

2. The following questions have been used on quizzes after the activity to assess students' ability to apply knowledge about ecological webs to analyze a new scenario. Two questions are focused on trophic cascades because that has been a central focus of the author's discussion sessions following the activity.

"Use Fig. 2 to answer the following questions.

I. If all the birds (K) in this food web suddenly go extinct, what would be expected to happen to:

a. the abundance of large arthropod predators (I)?

b. the abundance of small arthropod predators (F)?

c. the abundance of predatory nematodes (B)?

II. An invasive snake that eats only vertebrate predators (L) is added to this food web by humans. The population sizes of the vertebrate predators (L) decrease significantly. As a result of this invasion, what would likely happen to:

a. the number of birds (K) in the food web?

b. the number of protozoa (H)?

III. Which interaction in this web is most likely to be a mutualism? Describe the reason for your answer.

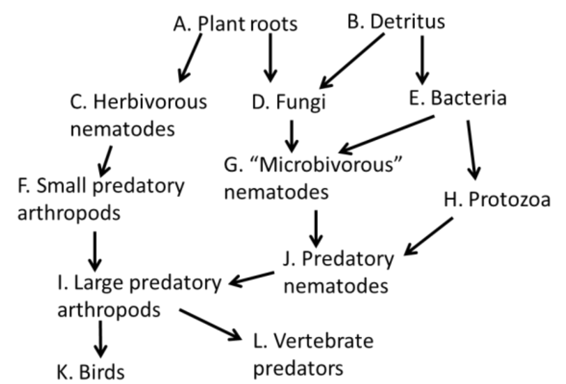


Figure 2. A generalized soil food web. Arrows point from the consumed organism/resource to the consumer. *Adapted from SWCS (2000).*

3. In an introductory ecology course for science majors, a summative assessment assignment has been given that extends the content associated with this activity. Students were asked to summarize and synthesize a set of peer-reviewed papers about ecological webs. The general text from this assignment is provided in Appendix A.

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Appendix A: Text from a summative-assessment assignment about ecological webs

Mini-literature review paper assignment – Ecological Webs & Trophic Cascades

Student objectives:

- Deepen understanding about interspecific interactions in complex ecological webs, esp. as they influence community structure and dynamics, including trophic cascades
- Gain experience in critically reading, summarizing, and synthesizing peer-reviewed articles
- Improve scientific writing skills

Overview:

For this assignment, students will write a mini-review paper (~4 pages, 12-pt font, double-spaced, 1" margins) that summarizes and synthesizes information from a set of articles about trophic cascades (all available in Bridges). Your tasks in this paper are to 1) explain the main results and conclusions of each paper, and 2) synthesize information from them to generate a general "emergent" take-home message (THM) that is gained from reading all of them.

Organization and content:

The paper should contain the following parts:

- A short, complete and informative title that explains the main point or theme of the paper
- An introduction (1-2 paragraphs) that sets the stage for the topic
    - Explain what ecological webs and trophic cascades are and why they are important concepts in ecology
    - Include BOTH objective AND thesis statements
    - It is ok (and even best) to state the objective explicitly: "The objective of this paper is to…"
    - For advice on writing a strong thesis, see: http://www.unc.edu/depts/wcweb/handouts/thesis.html
- A body that reviews the "take-home message" of each paper
    - You should not describe methods in detail but it is usually helpful to briefly state how the results of each study were obtained, e.g., in the field or lab, what treatments were used.
- Several paragraphs that compare AND synthesize the main, big-picture points from the papers
    - ***In this part, address this 2-part question:*** what is the relevance and implication of these studies to a general understanding of 1) ecological webs esp. factors affecting food webs and trophic cascades and 2) how to conserve biodiversity and ecosystem services?
- A conclusion (1 paragraph) describing the "emergent THM" that arises from all the papers
    - Summarize the main lesson about ecological webs that is gained from all the papers
    - Be general and think about the big-picture concerning biodiversity and ecosystem services
- Properly formatted citations MUST be included throughout the paper to show where the information comes from
- A properly formatted reference list MUST be given at the end

Assessment:

The paper will be scored using the following criteria:

- All the parts listed above are included, especially the objective and thesis statements.

- The discussed content is accurate and focuses on important points (without too much detail).
- It contains proper English mechanics including spelling, punctuation, word use and sentence structure.
- Its overall success as exemplified by ideas that flow together well among well-structured paragraphs.
- Citations and the reference list are formatted as described on p. 2.

Note:

Do NOT plagiarize from the articles. If you choose to use quotes from them, quotation marks MUST be placed around the quote. However, you should avoid using >2-3 quotes in the whole paper because having too many is poor scientific writing style. When in doubt, re-write in your own words.