

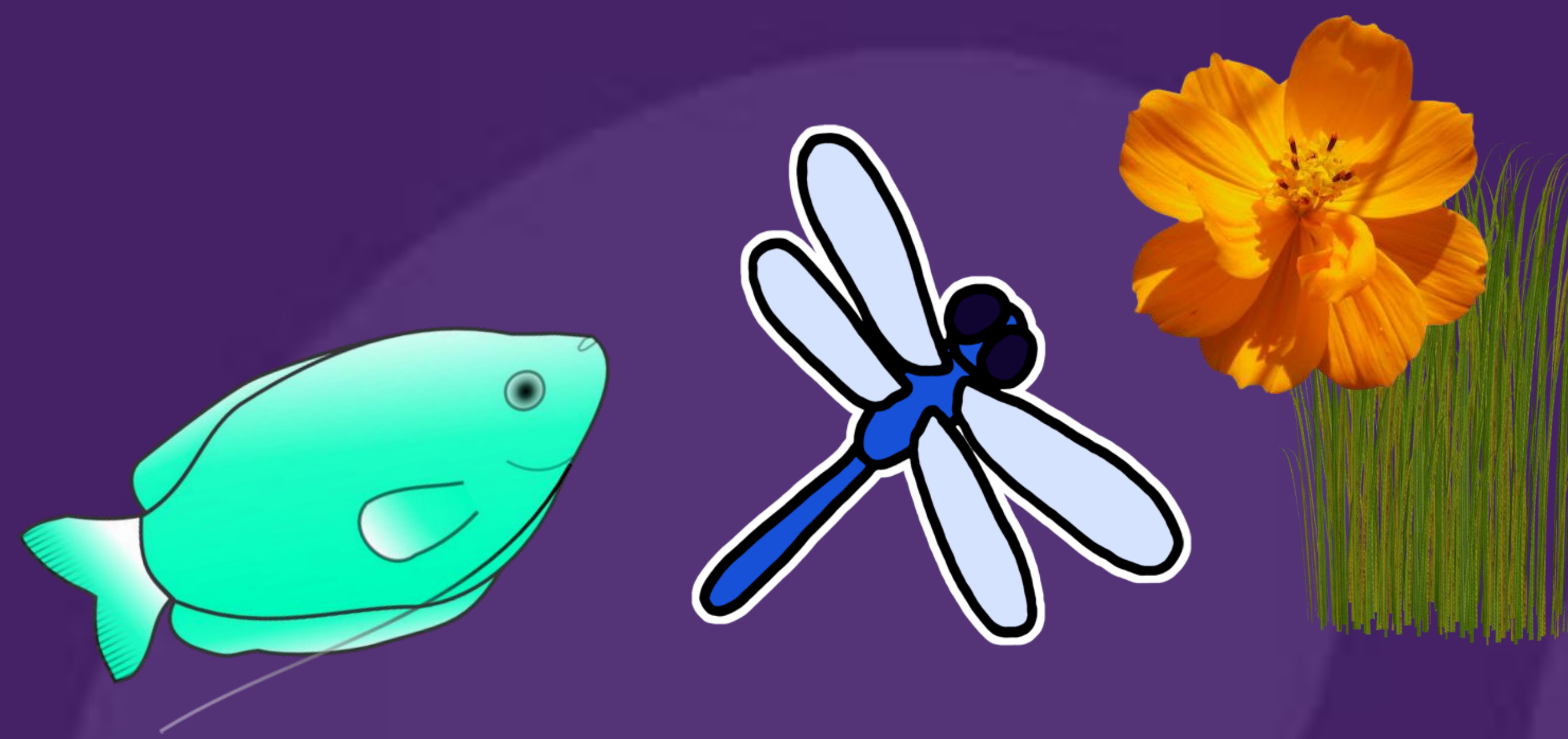


TEACHING ECOLOGICAL CONCEPTS THROUGH GAME BASED LEARNING

WHY USE GAMES?

“Knowledge accompanied by pleasurable emotion stays with us. It jumps to the surface and, when summoned, triggers other memory linkages to create metaphor, the cutting edge of creative thought. Rote learning, in contrast, fades quickly into a jumble of words, facts, and anecdotes.” E.O. Wilson, *The Creation*

Creating fun experiences in the classroom has been repeatedly cited to improve student learning through increased engagement. Furthermore, giving students opportunities to review and apply material increases the possibility of developing long-term memories. Thus, games can provide an avenue to foster development of higher-order thinking skills under the guise of competition.



EXAMPLE GAME 1: SCAVENGER HUNT

GOALS

- Apply basic terminology
- Connect ecological material to real-world systems and species
- Have fun exploring the campus or local zoo
- Have fun competing with other teams

INSTRUCTIONS

- The hunt location can be on campus or a local zoo
- Teams are each given a scavenger hunt list
- Scavenger hunts can focus on multiple concepts
- Concepts are the same, but the hunt requests different items
 - Example 1: (Conceptual area: species interactions) Find two species that are involved in each of the following two types of consumer-resource interactions.
 - Team 1: grazing, predation
 - Team 2: parasitic, predation
 - Example 2: (Conceptual area: species distributions) Find two species that are part of the following biomes.
 - Team 1: tropical deciduous forest, freshwater
 - Team 2: temperate grassland, subtropical desert
- Questions need to be designed so that students have to apply information. In the second example above, for instance, students have learned about the climatic and vegetative characteristics of biomes in addition to their geographic distribution. However, species informational signs at the zoo rarely list ‘biome’ but rather a distribution or vegetative/climatic requirements. Therefore students have to integrate information about the species into their pre-existing knowledge about biome classification.



WHY USE TEAMS?

Science is a collaborative endeavor.

In my upper-level ecology course, permanent teams of students are formed at the beginning of the semester. Their goal is to complete an intensive semester-long research project. Beyond the research itself, a major goal of the project is to impart the importance of collaboration in science.

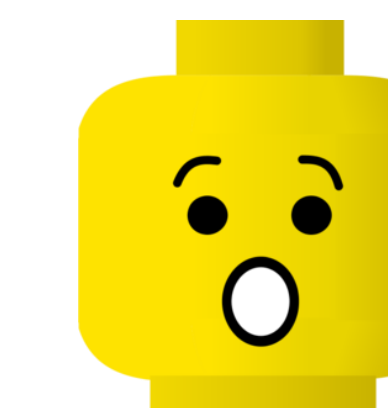


Students are often challenged by working in a team, and it is important to allow teams to bond. One way this can be done is through team-building exercises. However, while team-building exercises can bring students together and increase the quality of research, they do not increase learning of conceptual material, which can incidentally also increase the quality of research. Since teams are a component of many competitive activities, students are more comfortable working together within a group (teams) when taking part in games. Thus, ‘ecological games’ can in essence increase students’ abilities to ‘do science’ by focusing on both teamwork and student learning.

EXAMPLE GAME 2: ECO-CREATOR

GOALS

- Comprehend how components function within an ecosystem
- Improve communication skills
- Utilize creative thinking within a set time frame
- Have fun competing with other teams



INSTRUCTIONS

- Prepare a set of notecards depicting pictures or words representing a variety of elements within a system
 - Many of the elements need to be able to be linked together, but it is not necessary that all of them have the potential to be connected
- Teams start with a single element
- The remaining elements are placed collectively in a location across the classroom, referred to as the pool
- One member of each team is permitted to select a new element (only one) from the pool
- This proceeds until all the elements are taken
- Teams then work to build a system incorporating all of the elements
- Example 1: (Conceptual area: energy flow)
 - Cards are pictures of different species
 - Teams work to build a food web
- Example 2: (Conceptual area: nutrient flow)
 - Cards are words for different sources and sinks
- Teams work to depict a carbon cycle

MOTIVATION

TO PREPARE

Since each student is part of a (permanent) team, there is peer-pressure to contribute to decisions and work required during the games. Students become frustrated when the same individual repeatedly relies on the other members of the team, and they voice this frustration within their teams. Because the teams are permanent throughout the semester there is increasing pressure to contribute due to continued interaction with the same group of students. Therefore, students more readily review course content before and after class.

TO PARTICIPATE

All games end with a session that allows teams to present their best product to the class. Presentations must include justifications for the decisions that are made. At the conclusion, each team creates a ranking of all products that includes scores for creativity, quality, and communication. The winning team receives random rewards, which can include extra course points, an advantage in the next game, or even material items such as candy. When the rewards are varied and a surprise at the time of award, the stakes are always high during the game because students are each motivated by something different.

