

KBS K-12 Partnership Workshop April 11, 2012

Our theme for this workshop is Evolution and the Biodiversity of Life.

By the end of the workshop, teachers should:

Understand the three components of evolution by natural selection: variation, selection, and heredity

Recognize that populations evolve, not individuals

Describe where variation comes from, including mutation, drift, and gene flow

Consider the importance of time as a component in evolutionary change – evolution can be rapid, but occurs across, not within, generations

Recognize that environmental change is not always the “trigger” for evolutionary change

Stay tuned for details including abstracts for our concurrent sessions.

Agenda

8AM Breakfast, Announcements, and Tom's update (Auditorium)

8:30AM Speaker: Jenny Boughman (Auditorium)

9:30AM Break

9:45 Concurrent Session 1

- K-6: Geeked about Beaks with Alycia Lackey (Terrace Room)
- Middle/High School 1: Adaptation with Jennifer Doherty (Room 139)
- Middle/High School 2: Carbon Time Systems and Scale with Jenny Dauer (Room 141)
- Middle/High School 3: The Hunger Games: Hiding in Plain Sight with Michael Kuczynski and Kate Steensma (Room 145)

11:15AM Concurrent Session 2

- Elementary: Melissa Kjellvik (Terrace Room)
- Middle/High School 1: Carbon Time Ecosystems, Hannah Miller (Room 140)

- Middle/High School 2: If it ain't broke, it won't get fixed with Tyler Bassett (Room 145)
- Middle/High School 3: Evolving to Invade with Liz Schultheis, Tomomi Suwa, and Marcia Angle (Room 141)

12:30PM Lunch

1:30PM Concurrent Session 3

- Elementary: What Time is It: When Plants Bloom and Die with Leila Desotelle (Terrace Room)
- Middle/High School 1: The Wonderful World of Biosynthesis with Jonathon Schramm (Room 145)
- All Grades: Fertilization protocol for BEST plots with Leilei Ruan (Room 139)
- Middle/High School 3: Humans as a selective force with Christine Neiman and Nick Ballew (Room 141)

2:30PM What did my Fellow do this year - outside of the classroom? (Auditorium)

3:00PM District Planning and Evaluation (Auditorium)

4PM Adjourn and Teacher Advisory Committee Meeting

Concurrent Session Abstracts

Elementary Sessions:

Geeked about Beaks: Inquiry learning about survival and reproduction. With Alycia in the Terrace Room. Session 1.

In this lesson, students will learn about survival, reproduction, selection, adaptation, and evolution all while playing hands-on games and constructing their knowledge through experience. Students get to be birds and compete against their classmates to eat the most seeds. This activity demonstrates how small beaks are better at getting small seeds, whereas large beaks are better at getting large seeds. Next, students become part of a bird population with a variety of beak sizes. Depending on the weather, big, small, or medium seeds are common that year. Students observe how populations change over time based on the environment. Students explain why the population changes over time, and make predictions about what will happen to the population in future years. This topic connects to many K-6 topics, including organism's needs in their environments, competition, adaptation, survival, reproduction, and evolution. Additionally, this lesson helps students practice important inquiry skills: graphing and interpreting data.

Aphid Buffet. With Melissa K. in the Terrace Room. Session 2.

In this session we will implement all the stages of inquiry learning to design and conduct predator-prey experiments using live lady beetles and aphids. Aphids are small insects that suck sap out of plant stems and are known to be pests for any plant-lover or grower. Lady beetles are voracious predators that find aphids especially tasty. Aphids have a variety of different defensive strategies against predators including different color morphs, accumulating toxins, and behaviors such as falling off leaves when

shaken. We will test the success of these defensive strategies when we place lady beetles into an aphid buffet!

What Time is It? When Plants Bloom and Die. With Leila in the Terrace Room. Session 3.

This spring was unusually warm. Flowers and trees started blooming early. However, there could still be a hard frost! This workshop will cover how different plants are or are not adapted to freezing. We'll discuss how this relates to Michigan orchards and to climate change. We will also observe spring flowers!

Middle School/High School Sessions:

Adapting to Your Environment: Tanning, Camouflage, and Evolution. With Jennifer in Stack 139. Sess.1.

In this session we talk about how we might help students reconcile their everyday understanding of adaptation with an accurate understanding of natural selection. We would like for students to better understand natural selection by explicitly recognizing that:

- in common experience, adaptations usually refer to changes during an organism's lifetime,
- but in discussing natural selection we often use the term adaptations for heritable traits that increase fitness (the ability to survive and reproduce in the organism's environment).

To help reconcile our everyday experience with an understanding of natural selection, this activity discusses how natural selection can act on heritable traits that contribute to phenotypic plasticity (the ability of an organism to change its phenotype in response to the environment).

Carbon Time Systems and Scale. With Jenny D. in Stack 141. Session 1.

MSP Carbon and Carbon TIME Project have new and updated materials about Systems and Scale that could be used with classes in any content area. In this module we'll explore activities that can be used as an introduction to many science contexts since they frame several student's thinking practices. These activities apply to three cross-cutting concepts from the soon-to-be-released NGSS (Next Generation Science Standards), including scale, proportion, and quantity; systems and systems models; energy and matter, flows, cycles and conservation. These concepts are introduced by asking questions: why do some things burn and other things do not? What is air made up of? Students will be able to answer these questions on both a macro-scale and a molecular scale, and by distinguishing and conserving matter and energy. These activities lead to student thinking practices that will help explain physical and chemical changes in all content areas throughout the rest of the school year!

The Hunger Games. With Michael and Kate in Stack 145. Session 1.

Evolutionary biologists use the term "mimic" to describe a species that experiences increased fitness, or ability to survive, by resembling another species. Mimic species can resemble their "model" species in appearance, behavior, smell, or sound in order to deceive a "dupe" species – often a predator or prey. For instance, many insect species are driven by the selective force of predation to mimic noxious insects that their predators avoid. Carnivorous plants attract their prey with scents and coloration patterns that

resemble insect-pollinated flowers. In this session, participants will learn about several different examples of mimicry and how this evolutionary strategy evolves. We will discuss the density-dependence of mimicry – How much mimicry is too much? Lastly, participants will have the opportunity to play a scavenger hunt-like foraging game, in which they act as a “dupe” species, searching for their mimic prey species, while avoiding the noxious model species. Don’t be duped!

Carbon Time Ecosystems. With Hannah M. in Stack 140. Session 2

Join us for an MSP session that will introduce the Ecosystems unit from the Carbon TIME project. This resource will be available this spring and next year, and it will be useful for any class where students study carbon cycling, food pyramids, or energy flow in ecosystems. The Ecosystems unit is designed to help students think about transformations in matter and energy at a large scale. We will play the Carbon Game, one activity from the ecosystems unit. During the game, participants are carbon atoms moving between different carbon pools in a simple meadow ecosystem that includes air, producers, herbivores, carnivores, and decomposers. We (carbon atoms) will roll dice to determine which of the four carbon-transforming processes we go through as we cycle through the ecosystem: photosynthesis, biosynthesis, digestion, and cellular respiration. After the game is over, we will use a series of interactive graphs that are designed to help students think about their paths during the carbon game and how the carbon transforming processes impact the pools and fluxes of carbon in an ecosystem.

If it Ain’t Broke, it Won’t Get Fixed. With Tyler in Stack 145. Session 2.

This lesson will cover some of the ways we make inferences about the evolutionary relationships between organisms based on currently shared traits. In particular, we will focus on homologous (conserved) traits, such as limb structure in mammals, that link together seemingly dissimilar organisms. We will contrast this to analogous traits that may serve a similar function, but share no evolutionary past. Plan to venture out into the KBS grounds and test your skill at grouping organisms based on conserved traits.

Evolving to Invade. With Liz, Tomomi, and Marcia in Stack 141. Session 2.

In this session, teachers will learn a game that they can play with their middle to high school classes to demonstrate how evolution might create an invasive species. Many invasive species do not start to invade as soon as they are introduced into a new area; there is a “lag time” in most invasions where scientists predict they are evolving to their new habitat and waiting for beneficial genes to arrive, either through mutation or further introductions of new individuals from their native range. This game will demonstrate the basic components of evolution (variation and selection) and how they can cause an introduced species to become invasive and outcompete native species.

The Wonderful World of Biosynthesis. With Jonathon in Stack 145. Session 3.

Have you ever heard or used the expression, "You are what you eat?" Although there is a key biological truth embedded in that phrase, it also masks complexity that is easily missed by students. To understand how the materials of living things are constructed and related, students must develop a working understanding of biosynthesis, which is the set of processes organisms use to reorganize organic molecules within their bodies. In this session, we'll work with molecular models and organism posters to

follow materials through a food chain, from their uptake by producers to their incorporation into consumers and eventually decomposers. We'll get a hint of the incredible diversity of organic molecules, as well as an understanding of their fundamentally similar structures. In other words, we'll begin to fathom how evolution would have a pretty limited palette to work with if it wasn't for the wonders of biosynthesis!

Humans as a Selective Force. With Christine and Nick in Room 141. Session 3.

In this concurrent session, we will discuss some of the many species that humans act on as a selective force, how human selection occurs on those species, and the evolutionary consequences. We will then examine in detail how fishing can be a selective force, which will include performing a fishing simulation.

Sessions for All:

Fertilization Protocol for BEST Plots. With Leilei in Stack 139. Session 3. In this session, we will discuss why the BEST plots should be fertilized and will develop a practical fertilization protocol that students will understand. Additionally, we will talk about the trend of soil inorganic nitrogen in the GLBRC main site and discuss a possible schedule for our soil sampling. Finally, we will practice the protocol by spreading Osomocote on a similar sized plot.

Participant List

Email Sara Syswerda (parrsar1@msu.edu) or Robin Tinghitella (hibbsr@msu.edu) if you would like to be added to this list.

Comstock: Shirley Gilland, Laurie Anderson, Mary Lester

Delton-Kellogg: Connie High, Dale Grimes, Clint Waller

Galesburg-Augusta:

Gobles: Becky Drayton,

Gull Lake: Bev Brown, Michelle Mahar, Kim Clancy

Harper Creek: Meredith Hawkins, Maria Farkas, Jim Eckert, Joene Joostberns, Steve Barry, Alissa Renner, James Remus

Hastings: Marty Buehler, Jill Withey, Jamie Dixon

Kalamazoo Area Math Science Center: Cheryl Hach

Lawton:

Martin: Rob Robrahn

Olivet: Terri Morton, Mike Boehmer, Russ Stohlberg, Charles Bucienki, Marie Toburen

Parchment: Jodie Lugar-McManus

Plainwell: Lisa Wininger, Sandy Breitenbach, Noel Muselin

Vicksburg:

Visitors: Alrita Williams (Nsoroma Institute)

KBS: Tom Getty, Andy Anderson, Robin Tinghitella, Sara Syswerda, Jonathon Schramm, Jennifer Doherty, Alycia Reynolds-Lackey, Nick Ballew, Leila Desotelle, Leilei Ruan, Elizabeth Schultheis, Tomomi Suwa, Michael Kuczynski, Tyler Bassett, Christine Nieman, Kate Steensma, Marcia Angle, Melissa Kjelvik, Hannah Miller, Jenny Dauer, Cara Krieg, Dustin Kincaid, Jake Nalley

WMU Evaluation Staff: Bob Ruhf