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Organismic Scavenger Hunt

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"Study Nature not Books" L. Agassiz. This may be a bit simplistic. Books, lab rooms, and preserved specimens obviously have their place, but they need supplementing with the `real thing´. There are topics that just don't come across as well when looking at a 20-year-old frog in formalin, such as behavior, locomotion, ecology, or food webs. For many of these topics, biology students are much more engaged when the learning comes first hand, in the field, with living organisms. This mini activity is flexible and can be completed by any size class, ranging from introductory to upper level.

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Introduction

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Student Outline

Non-Majors Course

Introductory level biological science laboratory course - Biodiversity lab

Now that you have learned how a dichotomous key is made and used, you will be going outside onto the campus grounds to look for and collect two DIFFERENT insect specimens and two DIFFERENT woody plant specimens. We will be spending about 30 to 45 minutes outside collecting specimens as a group. You cannot be destructive of the area you collect from – replace rocks, mulch, etc. as they were found to the best of your ability. You and a partner will be using a data collection device, a Vernier LabQuest with GPS, and a temperature probe to collect data on location and temperature at the location that you find your organisms. You will be shown how to use the device and given instruction on note taking and specimen collection. Once back in the class, while you and your partner are keying out your organisms, the collected data will be downloaded and provided to you as a class.

You and a partner will need to take outside:

- Insect net
- Collection vials
- Forceps
- Notebook
- Writing utensil
- Vernier labquest with GPS and temperature sensor
- Optional – digital camera, smart phone or other digital imaging device

Data to be collected:

- Using Lab Quest - location and temperature
- Photograph of specimen in original location, if possible - partner or self
- Description of location and what the specimen's activity was at the time it was found

Lab assignment:

Once data are collected, write a brief description of the location of each of the specimens and specimen's activity. From this information, write a hypothesis of why each specimen was found at that location. This must be type written in complete sentences and paragraph form to be turned in at the beginning of the next lab.

Bonus: If you had access to other probes, what type of probe would you choose? What other data would you collect to help you determine if you will accept or reject your hypothesis? Write a brief description of the experiment's design.

Introductory Majors Course:

Background: Nine-Mile Prairie is a 230-acre (97-hectare) relict tallgrass prairie owned by the University of Nebraska Foundation. It is located on the northwest edge of Lincoln, in Lancaster County. The prairie was so named because it is five miles west and four miles north of the University of Nebraska campus in downtown Lincoln. Three hundred and ninety-two vascular plant species and over 80 species of birds have been observed on the prairie. Notable species include the federally-threatened prairie white fringed orchid (*Platanthera praeclara*) and the rare regal fritillary butterfly (*Speyeria idalia*). The prairie is also used as a seed source of local genotypes of grasses and wildflowers for use in prairie restoration efforts in the region. (2011, School of Natural Resources, UNL)

Goals: This activity has multiple purposes. First and foremost it is to get students out of the lab and into nature to make observations and enjoy the diversity of organisms we study in the lab as preserved specimens. You will notice it is much easier to learn about such things as behavior, locomotion, ecology from the living specimens you'll be finding out in the prairie. Second, you will be using some state of the art GPS devices and sensors to collect data at the exact locations you find organisms. This is our first test of the devices, and your input will let us know the best use of such devices, and assist us in fully implementing them in the lab course. Third, it will provide you with an opportunity to earn extra credit. Finally, it is not a goal of this activity to stress you out or spoon feed you answers. Here I want you to use your inductive science skills, think, come up with questions, and have fun. We don't always need to have a perfect definition or answer to have learned something! You really need to come out of this activity with many more questions than answers to have fully understood the point of the activity.

Activities: You must complete all activities listed below before leaving to attain credit. You will work in groups of 3 throughout all activities. Dividing the duties should help! **If you don't sign in and out you will not get credit!**

1. Overall you need to find 11 organisms and plot their locations with the Lab Quest device. Instructions will be orally given on how to do this. Remember to save your file.
    1) **Four** organisms need to be plants as described below. They all must be different species!
        i. Find one plant from the 9-mile kiosk.
            1. Common Name __________________, Scientific epithet__________________
        ii. Gymnosperm:
            2. Common Name__________________
        iii. Angiosperm:
            3. Monocot: Common Name __________________
            4. Dicot: Common Name __________________

        iv. OR: If you can find one Bryophyte, photograph it and mark its location, you can skip the rest of the plants!
        Common Name__________________ (moss, or liverwort)
    2) **Four** organisms need to be from insect orders:
        1. Common name __________________, Insect Order __________________
        2. Common name __________________, Insect Order __________________
        3. Common name __________________, Insect Order __________________
        4. Common name __________________, Insect Order __________________
    3) **One** organism needs to be an arthropod that is not an insect
        1. Common name __________________, Clade it belongs to __________________
    4) **Two** organisms need to be amniotes: (1 mammal and 1 reptile)
        1. Mammalia: Common Name__________________
        2. Reptilia: Common Name__________________

2. For the two individual organisms from #1 watch them for a period of time long enough to take some notes on anatomy, behavior, lifestyle, classification, etc. Include in complete sentences your hypotheses about why each organism was where you found it, what was it doing, what resources it was utilizing, etc.
    1) Organism name __________________, name of a clade it belongs to __________________.

        Notes:

    2) Organism name __________________, name of a clade it belongs to __________________.

        Notes:

3. For the most awesome organism doing the coolest thing from #2, first list below what organism it is and what it was doing. Then, using your hypotheses from #2 design an experiment that would help test at least one of the hypotheses. Make sure you use good handwriting, spelling and grammar (including complete sentences).

4. Pick two organisms that you found particularly interesting. You will need to photograph them, post the picture of each along with the name of the organism, the clade to which it belongs, and why it was interesting on the 103 lab Facebook page. Your lab partners do not count as the two organisms, but by all means take photos of your lab mates with your organisms and post the pictures.

Notes for the Instructor

Non-Majors Course:

Introductory level general biology course – Biodiversity lab:

In the biodiversity lab, students learn what a dichotomous key is, how it is constructed, and how to use a key to identify a specimen. Once those exercises are completed, the students are asked to use the Vernier LabQuest with the temperature probe and GPS activated when finding an insect (and/or plant sample) to bring back to class for identification during a short field trip on campus. Students are made aware of this outdoor field trip beforehand, so that they dress in appropriate clothing (shoes, hats, etc.) and take whatever other appropriate precautions they personally need to take to be outside (sunscreen, allergy medication, etc.) for 30 – 45 minutes on that day. The students are given instruction on how to use the LabQuest using the LabQuest Emulator Software (www.vernier.com/products/software/labquest-emulator) and given brief written instructions as a reminder.

Students are supplied with:

- Insect net
- Collection vials
- Vernier LabQuest with probe and GPS along with instruction for using it
- Instructions on collecting specimens
- Forceps

Students supply:

- Notebook
- Writing utensil
- Optional camera
- Items necessary for them to be outdoors for 30 to 45 minutes in the specific climate on that day

The students will work in pairs to collect specimens, one specimen per person. The students are to note the environment in which they find their specimen (shady, full sun, wet, dry, pond, etc.) and what activity the specimen may be engaged in at the time of collection.

Estimate travel time for going to and coming back from your collection site(s) into the time needed for this part of the lab. Avoid lawns and other cultivated areas. If a stream is nearby, that will provide a more varied environment in which to collect specimens. Go to the site(s) you are considering beforehand to be sure it is suitable for your purposes and to test the equipment used in the field. If there is not a good area near to the classroom to take students to by walking, here are a couple of suggestions:

1. If the group is small enough and you are able to obtain transportation and proper permissions, take the students to an area that is in a more natural state.
2. If you have enough equipment, check out equipment to the students and provide them with instructions for its use and how to collect specimens. Have them come to the next class with the equipment and specimens.

Tips on collecting and preserving insects:

Have container with a lid, e.g. a jar. Use the jar to trap the insect, slide a piece of paper under the jar, and then carefully put on a lid. An alternate version is to use an insect net and then transfer what you catch into a jar.

Place the closed jar in the freezer until the insect is dead, and then with a pair of tweezers carefully place the insect inside of the ethanol vial or in a larger container if needed.

Where to find insects:

A way to attract nocturnal insects (especially moths) is to set up a light trap. A simple light trap is made by hanging a white sheet, or find a white wall, and project either a regular light (or a blacklight) onto it. The best areas are sites near natural vegetation and away from city lights. Either hang out to watch or come back in an hour or two.

Build a simple funnel trap with a piece of paper rolled into a cone, and placed into a jar containing something that has a strong smell. Insects (especially flies) will fly in, but not be able to escape.

Take a piece of cardboard, put it under a bush or tree limb and shake the foliage, collect herbivorous insects (or their predators) that fall off (grasshoppers, lady bugs, stinkbugs).

Look under rocks, decaying leaves, or break apart rotten wood (beetles).

Visit a flowering plant and collect a pollinator(bees, flies, butterflies) or a pond or stream with a small net (such as those used for aquaria) and see if you can collect a mature aquatic insect (e.g. a water strider)

Place out bait, such as something sweet, or something rich in protein/fat such as raw meat, on the ground (ants, wasps). Check back later see what has come along.

Introductory Majors Course:

Much of this activity can be tailored to any course. It has been utilized to bring students into a natural environment to see the organisms studied in lab, but in their natural setting. Students apply the knowledge learned in class to answer question concerning why the organisms are found where they are. We ask students to think about the adaptations of various lineages of organisms, and also to key out the organisms they find.

The first decision to make is on a location. A natural prairie, wetland, or other undisturbed area is best, though any space with diverse flora and fauna may be used. The types of organisms that you wish the students to find can be tailored to your course.

After you have a location, you will want to test the data collection devices you are using in that location. It has been helpful to do some preliminary collection, prior to sending students out. You will then know the approximate locations of the various organisms and may assist students during the activity. The devices used in this mini are the Vernier LabQuest (I and II). For training students or TAs on the use of the devices there is a free emulator program described in the links following.

For the major students, we bring along a number of relevant dichotomous keys to assist the students in identifying the specimens they find. Applicable keys will depend upon your region. Some general keys we utilize are from the "How to Know" Series. Many are out of print but can be bought cheaply on Amazon.com

Students need to be provided with a GPS enabled data collection device (Vernier LabQuest). Some other items we use to promote student activity are nets, capture containers, binoculars, bug spray. Remind students to dress appropriately, and warn them of any dangerous organisms, poison ivy, etc. Water bottles might also be a necessity if traveling off campus.

Upon returning from the field all of the student data can be pulled from the LabQuest devices and analyzed within the Vernier software. The software can be attained free of charge (Logger Lite), or a paid version (Logger Pro) can be purchased for $189.00. Once a copy of the software is purchased, anyone in your institution who would like may copy and use it. Multiple copies do not need to be purchased. Within this software you can export all your data points into a Google Earth view to see exactly where each of the organisms was found. This will assist students with answering why they found the organisms where they found them. If this activity is being done in an upper level course it would be recommended that students be brought back to the field after designing experimental procedures utilizing the various Vernier sensors to test their hypotheses about why they found specific organisms where they found them.

Important Links:

- Vernier:
  www.vernier.com
- Logger Software:
  www.vernier.com/products/software/
- LabQuest2:
  www.vernier.com/products/interfaces/labq2/?lq2-home
- Emulator Software:
  www.vernier.com/products/software/labquest-emulator/

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About the Authors

Timothy J. Suhr received his BS in Biology from the University of Nebraska-Lincoln in 2002. At that time he began work in the Avian Cognition Laboratory at the University of Nebraska-Lincoln. In 2007, he accepted a position as the Organismic Biology (103) Lab Coordinator, and in addition is working towards a MS in Entomology at the University of Nebraska-Lincoln.

Beth A. Whitaker received her BS and MS from the University of Nebraska-Lincoln. After working as a laboratory technologist and laboratory manager in microbiology research laboratories for over 13 years, she obtained her current position as Bios 101L (non-majors general biology course) laboratory manager at the University of Nebraska-Lincoln in 2003.

Mission, Review Process & Disclaimer

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