

Field Entomology for Educators
SYLLABUS/Provencher
3 graduate credits

Sponsoring Organizations: Berkshire STEM Pipeline, MCLA, Pittsfield State Forest

Course Location: Pittsfield State Forest
Schedule: August 3 through 7, 2009

Target Audience: Middle and High School teachers

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Rationale

Insects are an integral part of human lives; they are as fascinating and beautiful as they are weird and horrific. They are the bane of human existence because of food competition and disease, yet we cannot live without them. Insects hold an incredible wealth of information for scientists and lay people alike. The purpose of this course is to enable educators as well as their students to gain the opportunity to learn, through inquiry and observation about biology, ecology and environmental science. These topics can also be integrated with math, history, language arts and social studies. Given the current concern in biodiversity loss and sustainability, we must recognize that insects, which make up the largest living group on earth, represent the major part of existing biodiversity. With this in mind they almost certainly hold solutions to global sustainability. It is crucial that we recognize them as organisms to understand and study.

Educators teaching biology face a wide range of concepts: the characteristics of living things, reproduction and heredity, genetics, structure and function of cells, evolution and biodiversity, adaptations, energy cycles, ecology and biotechnology. The discipline of entomology is a great vehicle to get at the heart of these topics. This field entomology course will demonstrate to teachers how accessible and versatile insects can be as models when addressing these challenging concepts.

Course Description

This course is intended for 6-12 science educators. It is designed to help teachers address the Curriculum Frameworks and MCAS for teaching biology* and environmental science. The format of the course will be 45 hours of field studies, discussions, presentations, practicums and hands-on experiences, dissections and mounting. Participants will be assigned readings and writings prior to course and will be required to spend additional hours to complete projects outside of the field course time that demonstrate their learning.

*Biology here includes ecology, paleontology, physiology, developmental biology, genetics, biodiversity and molecular biology.

Objectives:

Teachers who complete this course will be able to:

- develop an appreciation and understanding of the biology, genetics of insects
- develop an appreciation and understanding of the underlying reasons for the diversity, adaptability of insects
- develop an appreciation and understanding of the underlying reasons for evolutionary and ecological success of insects
- compile a reference collection of insects representing the local insect fauna
- demonstrate proper data collection, preservation, mounting, labeling and rearing techniques for insects and other arthropods in the classroom
- become comfortable using selected insects for teaching science concepts through inquiry

- appreciate how insects relate to the rest of the planet, and their role in our society
- provide instruction, resources, and teaching strategies using insects that help students learn related concepts
- provide teachers with opportunities to work with an entomologist

Activities:

- Site visits to local industrial and environmental sites provide background and context for the instructional projects.
- Faculty presentations and discussions provide in-depth exploration of science, history, and business topics.
- Daily field journal notes (submitted to the Course Web Site) provide opportunities to record observations and reflect on possible curricular implications.
- Online course area provides a space for sharing ideas with course participants and submitting assignments to course instructors.
- Showcase Website will display completed projects.

Required Project

Create a learning unit of five lessons that includes hands-on, active learning strategies directly related to entomology. Alternate assignments might include a paper, digital storytelling, or another project of your choice, subject to professors' approval (in which case, alternate forms of assessment would be used). Final projects should be included in their final project plans links to school and district priorities.

Project Evaluation Guidelines

- Project demonstrates teacher's ability to design effective instruction;
- Project/unit rationale is tied to entomology and helps students understand how science works;
- Project/unit helps students understand the challenges for and successes of scientists past and present;
- Project/unit helps students understand important concepts in biology;
- Project/unit helps students gain skills in biology
- Project/unit helps students recognize and be wowed by Nature;
- Learning objectives are clearly stated;
- Links to curriculum frameworks are given
- Engaged and relevant learning activities or tasks are provided;
- Unit includes the activities and materials that will be used for individual lessons;
- Assessment rubrics are provided;
- Lessons include the hands-on, active learning strategies for teaching and learning;
- Objectives, activities, and assessments directly correlate with one another.

Design and develop a content-specific project which builds on your understandings about entomology related topics. The project can be designed for use by students (and/or other teachers) at your school or at schools across the Berkshires and across the world). All projects should adhere to the philosophy that teaching and learning in context helps students understand the connections between content of the curriculum and the world outside the classroom.

Projects will be assessed on the degree to which they:

- Familiarize students (and/or teachers) with significant aspects in entomology as it relates to one or more of the following topics: ecology, genetics, chemistry and environmental science.
- Include hands-on, place-based opportunities for students (e.g. field-trips to sites featured in this course, online collaboration related to local activities, etc.).
- Address relevant content that connects to the Massachusetts Frameworks for Learning.

- Include interdisciplinary connections (contextual learning is not about content in isolation; if not included in the unit itself, connections can be in pre- or post-unit activities).
- Use active learning teaching methods (e.g. inquiry based learning, project-based learning).

Project Possibilities:

You can select from the following possibilities:

1. A curriculum unit.

The unit must include not only the description, but also the activities and materials that will be used for individual lessons. (E.g. Webquest, handouts or worksheets for students, PowerPoint presentations). A template for the unit development and sample units are provided on the course website. Your lessons (6 to 10) should include the hands-on, active learning, context-based strategies, directly related to entomology.

2. A resource collection (see examples below)

a. You might develop a collection of lesson plans related entomology (revised for Massachusetts Curriculum Frameworks) using resources from nationally reviewed sites such as the MarcoPolo collection. If you choose this option, you will need to include an explanation of how to use the lessons; suggestions for adapting each lesson to the Massachusetts Curriculum Frameworks and to the criteria (above) for this course. The lesson plans should involve active-learning and contextual learning activities.

b. You could create a “local insect collection to share with your class. This project must include background information (e.g. web sites, materials) for each insect order along with contextual active-learning activities that students could do to learn before and/or after being shown the collection.

3. A collaborative project

You could design a local project (citizen science) that is connected to national or international projects in other classrooms or universities.

<https://www.mos.org/fireflywatch/>

<http://www.spiderwebwatch.org/>

4. A written or digital storytelling project

If you enjoy writing and/or digital photography or video, you could design a book, video and other resources that could be used to create a compelling story of some aspect of entomology. Provide a written guide that a teacher could use. If you choose this option, your written guide to the resource would need to include activities for using it in the classroom as well as an explanation of how it is based on the contextual learning approach required for this course.

Evaluation

The format of the course will be field studies (50%), discussions (10%), presentations and written reflections on readings (20%), practicums (5%) and final projects (10%).

Required Text:

Kaufman, Kenn and Eaton, Eric, 2007, *Kaufman Field Guide to Insects of North America*. Houghton Mifflin Harcourt, USA. 1 edition

Imes, Rick. 1992. *The Practical Entomologist: An Introductory Guide*. Simon & Schuster, New York, USA

Multiple handouts created for the course.

Suggested Texts:

Resh, Vincent H., Carde, Ring A., 2003, *Encyclopedia of Insects*. Academic Press, Elsevier. USA.

White, Richard, E. 1998, *A Field Guide to Insects: America North of Mexico*. Mariner Books. USA

Tentative schedule (depending on weather topics may be moved around) August 3-7, 2009

Day	Topic	Locations	Activities
Monday	What is an insect? And why should we study them?	Lodge and field	Lecture, discussion, field collecting. Practicum 1 Dissecting a grasshopper
Tuesday	The Insect Orders and Life Cycles	Lodge, stream and pond	Lecture, discussion, aquatic collecting. Identification.
Wednesday	Insects, Ecology and the Environment	Lodge and forest Night Collecting (optional)	Lecture, discussion, forest collecting. Pinning and mounting
Thursday	Insects, Genetics, Biodiversity and Evolution	Lodge, forest and field Berlese funnel	Lecture, discussion, forest collecting. Pinning and mounting
Friday	Insects and Society	Lodge, forest and field	Lecture, discussion, forest collecting. Practicum 2