**Master Gardener Basic Training: Entomology**

**Learning Objectives**

At the conclusion of this module, students should be able to:

1. Identify the basic anatomy of insects and other arthropods that you may encounter in the garden
2. Distinguish insects from non-insect arthropods
3. Explain the major types of insect life cycles, and the associated stages of development.
4. Distinguish adult insects from juvenile insects.
5. Recognize the different types of insect wings
6. Identify common orders of garden insects: Dermaptera, Thysanoptera, Hemiptera (including differences between Homoptera and Heteroptera), Coleoptera, Neuroptera, Diptera, Lepidoptera, Hymenoptera
7. Identify the four major types of garden insect guilds: Herbivore, Predator, Pollinator, Parasitoid
8. Identify the different types of insect mouthparts and feeding styles: piercing/sucking, chewing.
9. Diagnose common insect problems in the garden.
10. Name 2-3 beneficial garden insects and 2-3 garden insect pests.

**Core Competencies**:

In this lesson, Master Gardeners will need to gain competency in identifying different types of insect pests. The focus should be on the identification of insects (to the taxonomic level of Order)5,6 and their damage (based upon mouthparts and feeding style)8, 9. In order to become competent in the identification of insects and their damage, it is first important for Master Gardeners to understand basic insect anatomy (i.e. the insect body plan)1, how insects differ from other arthropods (i.e. number of legs, number of antennae, wings)1, 2, and how metamorphosis might complicate insect identification (i.e. juveniles are more difficult to identify, compared to adults)3, 4.

Students should also gain an appreciation for the fact that not all insects are garden pests7, and that many of them are beneficial10. Correctly identifying insects in the garden is one of the best ways to reduce pesticide use. Make sure students understand that their ID skills will benefit their own gardening, but will also help their community to make more sustainable choices.

Students should be able to practice basic identification skills (of insects, of their damage)9, and should understand how a sustainable management recommendation is critically dependent upon proper ID.

**Instructional Tools**

Keep in mind, that in addition to your lesson, students will also have the lesson’s reading, homework, and a quiz which they can learn from. Mastery of the material is not necessary for the quiz. Often, students remember the questions they missed, more than the questions they aced.

Create a Motivational Learning Environment (adapted from Wlodkowski, R. 2004, page 152)

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| **Motivational Condition and Question** | **Learning Condition** |
| Establishing Inclusion (beginning)  *Create an atmosphere where students feel respected by and connected with others in the class.* | Ice Breaker Activity (centered around shared experiences).  Have students work in groups of 2-4 (depending on class size). Ask students to interview 1-3 of their classmates. Each student should share:   * What is your favorite insect, and why? * What is your least favorite insect, and why? * What is one insect you would like to conquer in your garden? * What is one insect you hope to learn more about? |
| Developing Attitude (beginning)  *Make the material personally relevant to students, and allow them to choose one insect to investigate, more closely. Evoke curiosity about insects, by sharing something that you personally find to be fascinating/strange about garden insects.* | Personally Relevant Learning Goals (focused on an insect of interest to each student)  From the previous activity, make a list of the insects that students want to know more about. Have students work in small groups, choose one insect (or be assigned an insect), and to answer the following questions:   * Common Name * Order * Metamorphosis * Wing Type * Mouthparts * Ecological Guild (Predator, Herbivore, Pollinator, Parasitoid) |
| Enhancing Meaning (throughout)  *Challenge students to learn more about garden insects, using the basic information that you have provided in lecture, supplemented with additional materials (i.e. PNW Handbooks, internet search of .edu sites).* | Critical Thinking and Analysis (allow students to seek their own answers)  Let students choose their insect, prior to lecture. Knowing they will have to answer these questions, in small group work, will help guide their notetaking and will encourage engagement.  Try to balance the assigned insects, so that you’re hitting all eight garden insect orders. In lecture, focus on hitting objectives 1-5, 7, 8. Encourage students to take notes, so they will know how to answer the questions for their insect. Record student work on flip chart paper (provided by MG coordinator). |
| Engendering Competence (end)  *Let students share their mastery of the material, by sharing the results of their small group work with others.* | Allow students to teach each other about their assigned insect. As an instructor, your role is to correct misinformation, and then to show connections between their insect, and closely related species that gardeners might know. Encourage students to take notes during this portion. You may also want to have students take a short self-assessment quiz, to gauge their areas of mastery and areas where they could improve.  End the class by asking students to share the key items they learned. Summarize key points. |

Wlodkowski, R. 2004. [Creating motivating learning environments](http://raymondwlodkowski.com/Materials/AdultLearningMethods.pdf). in Galbraith, W. (ed). Adult Learning Methods: A Guide for Effective Instruction, 3rd Ed. Malabar, Florida: Krieger Publishing Company.