**Objective**
To increase students’ observation skills and awareness of details through rearing and observing monarch larvae.

**Background**
In this lesson, students will work cooperatively to develop observation and uniform reporting skills, first using familiar objects and then monarch larvae. This will introduce them to monarch biology and also give them practice in the important scientific skills of observation and description. At the end of the lesson, the entire class will have developed a “class descriptor pool” that they can use in journal keeping or future observations. Hopefully, they will also come up with interesting questions that they could use in developing class or individual experiments.

It works best to divide the class into groups of four students who can look closely at one or a few larvae. The lesson can be turned into a game to see which group can come up with the most unique observations.

**Procedure**

1. Ask the students what it means to “observe” something. Use a familiar object to practice describing exactly what is seen. For example, hold up an apple and ask students to describe it, using as many of their senses as possible. Students might say it is: red, round, smooth, woody stem, about the size of my fist, shiny, waxy, streaked with green, spotted with pin sized yellow dots, firm. Students might also describe the apple as delicious, gross, crunchy, yucky, yummy, etc. Help students understand the difference between observations and opinions or assumptions related to the apple. Remind them that they will practice listing observable attributes and characteristics, without listing opinions or making assumptions.

2. Divide students into cooperative groups of three or four. Assign the following jobs: recorder - records the group’s list of observations and attributes; reporter - speaks for the group; encourager - gives positive feedback, asks for input from all members; and getter - gets and returns materials.

3. Have each Getter get a paper bag (containing one familiar object) for his or her group. Students should not be allowed to look in the bag until returning to their group. Warn students not to say the name of the object aloud, but to pass the bag around in their group, allowing

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**Key Concepts:**
- Observations are different than assumptions
- Observations can be physical or behavioral
- Observing leads to questioning

**Skills:**
- Observation
- Descriptive writing
- Group work

**Materials:**
- Larvae in observation containers (with milkweed)
- Hand lenses or other magnification devices
- Paper and pencil for each group
- One each of 8 familiar objects (bottle cap, hole punch, pencil top eraser, scissors, paper clip, staple remover, etc.)
- 8 paper bags
- Large paper (or digital equivalent) to 1) list and post class descriptor pool; 2) list class questions (optional)
each member to carefully look at and touch the object. They may take it out of the bag, but should try to prevent other groups from seeing their object.

4. Together, the group should work to describe the object. For three to five minutes, they should use terms which relate to their object’s color, size, texture, material, and other attributes, without forming opinions, or making assumptions. (For example, a stapler might be metal, gray, cold, hard, used to hold papers together, etc.; but it should not be listed as useful, handy, ugly, etc.). The Recorder should record all of the group’s descriptions.

5. After three to five minutes, stop students. Ask them to go back over their lists, discuss and cross out any descriptions which include an opinion or judgment.

6. Next, each group’s Reporter should describe the object in their group’s bag using the group list, to see if other students can guess the object from this concise description. Once an object is guessed, ask the guesser which description was most useful to him or her.

7. Have groups discuss what they think the characteristics of monarch larvae are.

8. Students are now ready to transfer these skills to the study of monarchs. Getters should bring a container of monarch larvae and hand lenses to their table. Students should examine their larva in its container. You may want to tell them that their observations could include both physical features and behaviors, or wait until they have made observations, and then divide their observations into these two categories. The following questions could direct their initial observations:

- How big is your larva?
- What colors is it?
- Describe the body.
- What does the head look like?
- Do you see legs? How many? What do they look like? Where are they?
- Are your caterpillars eating? How do they eat?
- How does the caterpillar move?
- What do the caterpillars do in your hand? What do they feel like?
- What happens when you touch the black things sticking out of both ends (filaments or tentacles, not antennae)?
- Can you tell the front from the back of the caterpillars? How?
- Can you see eyes?
- Can you see antennae?

8. Give students 10–15 minutes to closely observe their larvae. Butterfly and Moth Life Cycles in the Monarch Biology section has drawings, scanning electron microscope photos and diagrams that you may want to make available as the students observe their larvae. Some of these illustrations are also in the Blackline section.

9. The Recorder should make a list of the groups’ observations.

10. Make a class descriptor pool that includes all of the observations. If you plan to have students keep monarch journals, keep this list posted in your room. Students can refer to it to “jump start” their entries when they are stumped as to what to write. Go around the room, having the Reporter from each group take turns telling the class one unique observation from their list. They should only report observations that are not already on the list. Groups that have made the most unique observations will add most to the class descriptor pool. You may want to separate physical (e.g., front tentacles are longer than back tentacles) from behavioral (e.g., curls up when touched) observations by putting stars in front of behavioral observations.
Sample observations: has two sets of tentacles; has yellow, black and white stripes; is 5 cm. long; front three pairs of legs have “claws;” has very small eyes; eats all the time; last five pairs of legs have little hooks on them.

11. Make a list of questions that students had while they were observing their larvae. This can be done while they are in their small groups. The teacher can record questions students say without students knowing they are being listened to.

Sample questions: Why does it curl when touched? What does it do with other larvae? How big will it get? How much can it eat?

12. Close and assess this lesson by congratulating students on their observations and asking them if they observed features of the larvae that they hadn’t noticed before. Use this format: What difference is there between your impressions and opinions about the monarch caterpillars before, and what you actually observed?

Examples of student responses: I thought that the larvae were green, but I observed that they are yellow, black, and white striped. I thought their legs were all the same, but the front six are different than the others.

Encourage students to use this format: I thought (assumed) that ________, but I observed __________________.