

FOSS® INSECTS TEACHER PREPARATION VIDEO TRANSCRIPT

<Larry Lowery Introduction to FOSS Program>

Lowery: Hello. Welcome to the Full Option Science System. This program was funded by the National Science Foundation. Its goal was to develop materials that would involve youngsters with both the processes and the content of science.

The program is developed with the Lawrence Hall of Science, with scientists, science educators and teachers working together as a team to develop the materials. The materials are tested in the hands of teachers and children in classrooms. It takes about two years to turn out a module.

Each module begins with firsthand experiences. This is done because it has been found that firsthand experiences are the best way for youngsters to learn about the concepts of science. As the module progresses, children are introduced to abstractions and reading materials. The sequence from firsthand experiences through reading materials is deliberate because it has been found that youngsters, when they have some experience before they read, learn and understand more from the reading. Authors of reading materials can then take youngsters to greater abstractions.

Trust the materials that you are getting acquainted with. They have been well tested. We have found that they work extremely well in the hands of all teachers and are effective for youngsters in learning about science.

<Linda De Lucchi Introduction to Module>

Narrator/Linda De Lucchi: Hello. My name is Linda De Lucchi. Together we're going to take a journey into the fascinating world of insects through the eyes of six- and seven-year-olds. There are more different kinds of insects on this planet than there are all other kinds of animals taken together. But we won't bring them all into your classroom. Just six or seven of the most interesting and appropriate animals for classroom investigation.

Your youngsters will have an opportunity to observe structures, behaviors and changes of these different kinds of insects over time. They'll be able to compare them, observe their life sequences and their life cycles perhaps. We hope that the activities will generate a renewed respect for life of different kinds of life forms and interests and curiosity on the part of the students.

There are a number of things that you need to think about when you enter into this module. First thing, you do need to plan ahead and consider how you're going to get the organisms and when they are going to arrive. You also need to stay quite flexible. We'll try to guide you through the activities. But we can't determine -- we can't predict exactly what's going to happen in your classroom. So you need to stay flexible and go with things as they come up.

And a third thing is that you need to be patient. The kids will want to observe, and we want

them to make discoveries on their own. So try not to give them information. Try not to tell them things that they'll observe. But let them do it on their own. At times you will have to provide information. But most of the time we want the students to do the telling and thereby make the discoveries themselves.

Let's take a look at the equipment that you'll need for this module. There's enough equipment in these two boxes for your class of 32 students to do all of the activities. Inside the box you'll also find the teacher preparation video. That's the one you're looking at right now. And the third component that you will find is the Teacher Guide. This is probably the most important thing in the equipment kit.

Be sure to read the Overview folio before you begin teaching the module. It contains many helpful suggestions for getting started. In it are the national standards that are addressed in this module, background information on insects, ideas for organizing your classroom for the investigations, and suggestions for scheduling the activities. The scheduling chart will be particularly important in this module dealing with living organisms. The overview matrix will help you plan the entire module and integrate it into other areas of the curriculum.

In the Materials folio, you will find an inventory list for the kit, lists of any materials you'll need to provide for the investigations and directions for ordering the insects and planning for their care when they arrive. This is critically important information, so read it thoroughly and plan ahead for getting the organisms to your classroom.

The FOSS publisher provides coupons for ordering all of the insects individually. Plan ahead. Order them at least three weeks in advance and specify a delivery date to your classroom. Information on ordering any replacements is found on the back page.

The next four folios are the Investigation folios. These are the heart of the program. The first page gives overview information. The At A Glance chart summarizes the investigation and helps you plan for assessments and extension activities. Next you'll find background information specific to the investigation. And there is a section called Teaching Children About which gives you some insights into the research on how children think and learn.

Each investigation has several parts. For each part you'll find a materials list, Getting Ready section and step-by-step directions for guiding the investigation. The interdisciplinary section in the back of the folio has many ideas for extending the investigation into other areas of your curriculum.

In the next section are the duplication masters. Here you'll find all the student sheets used in each investigation. There are also masters for math extensions, and Home/School Connections for each investigation.

There are lots of ways to assess your students' learning as they progress through the investigations. Read through the module assessment folio at the back of the Teacher's Guide for more information about the formative assessment suggested for each session, end-of-the-module assessments and portfolio suggestions.

After the assessment folio, you'll find duplication masters to help you with the assessments. On

the Anecdotal Notes you can record your students' insights or the difficulties they run into. The assessment checklist is used when assessing specific skills or concepts the students learned.

In the kit you'll find a class big book and eight matching student books, the FOSS Science Stories for insects. These are designed for these to be read periodically throughout the module after students have had the hands-on experience of the activities. The Science Stories folio found in the Teacher Guide provides background information and follow-up activities. Check out the resources folio located near the back of the guide. This annotated list includes both fiction and non-fiction books for student reading, videos, software and teacher resources.

There are a few things to get ready that you'll use throughout the module. Make copies of the Anecdotal Notes and the assessment checklist sheets for assessing student understanding during the investigations. Some teachers write in students' names before making copies. Word Bank and Content charts are used to help students remember the new vocabulary and concepts they learn as the module progresses. Students will add to these charts at the end of each session.

In addition to the content charts, prepare life cycle summary sheets to be used at the end of each investigation. These summarize student observations about the insects at different stages in the life cycle.

<Investigation 1, Part 1>

Narrator: The activities in this module can be done in any order. The time from egg or larva to adult is highly variable, depending upon the temperature. But we suggest that you start with Activity 1, Mealworms, because these insects are very easy to care for in the classroom and the students will be able to observe their life cycle in the ten-week period. Let's take a look at the equipment that you will need for Part 1.

From the kit you'll need to get these items: The clear basin that's going to be the class mealworm habitat, the plastic cups used to distribute materials, the vials with snap lids that each student will use to create their individual mealworm habitat, the screen that you can use to sift out the bran from the mealworms, labels to cut apart that each student will use to put on the lid of their vial with their name, push pins that the students use to poke holes in the lid of the vials so the mealworms have some air, hand lenses, one for each student for observing the mealworms.

Make copies of the duplication masters: The letter home to parents so the parents will know about the insects their students are investigating; the insect record where the students can draw pictures, both life size and magnified, and write some words describing their insect; and the life of a mealworm booklet cover. It's a calendar where the students can record some major events in the life of their mealworms. The life of a mealworm calendar and six to eight insect record sheets can be stapled together to make a journal for each student. And for the class you'll want to keep this large calendar that includes information on the changes that occur in the insects over time.

These are the items that the teacher needs to provide for Part 1: A strawberry basket or some other kind of container to hold one groups' four vials, a marking pen -- an erasable marking pen for recording on the class calendar, scissors to cut the labels apart, a half sheet of white paper for each student to use to observe their mealworms, a knife to cut the food that will provide moisture for the mealworms.

Some of those foods include a sweet potato, a white potato, apple. You can also use carrots. You'll need to get some wheat bran from the grocery store. That's the food for the mealworms. And most importantly, you'll need to secure 200 mealworms from your local pet store.

Teacher: When was the last time you saw an insect? When did you see an insect last?

Narrator: The teacher starts the discussion by asking the students when was the last time they saw an insect and what was that insect doing and how did they know it was an insect. Students will say a variety of things. It will get the students starting to think about insects.

Teacher: Well, we've got something living to show you today.

Narrator: Then the teacher introduces the mealworms as an insect. She tells the class that everybody will get one to observe. The insects are distributed to each group of four students in a cup. Each group gets eight mealworms. Each student gets a half sheet of paper and a hand lens to observe. After 10 or 15 minutes, the teacher calls the students back to the rug and engages them in a discussion about what they observed.

Teacher: What did you see? What did you notice about the mealworms?
Tammy?

Student: I saw on the tail there was two dots.

Teacher: You saw two dots on the tail?
Bonnie?

Student: They only moved with their front and they steered with their front. They didn't steer with their back.

Teacher: Oh, I see.

Narrator: Invariably during this discussion one student will ask "Can we keep them?" And that's perfect because now you can guide the discussion towards what do we need to know and what do we need to do if we're going to keep these mealworms.

The teacher needs to work with the students to come up with four important items: The mealworms, like all living things, need food. They need a place to live or space. They need air so they can breathe. And they need water or moisture. Those are the four things that are introduced here and will be introduced when all the other insects are brought into the classroom.

This is how we prepare the insects: First thing we do is get a vial. Each student gets their own vial and a label. Students write their name on the label and then take it off, put it on the lid. It doesn't quite fit. There's a little bit of overlap, but that's fine.

Then take a push pin and make, oh, about 20 holes in there. Right through the label, that's fine. That provides the air. We're going to put a couple pinches of bran in here. The number of pinches depends on the size of your pinch. That's pretty good, just about that much.

Then we're going to put in a tiny bit, just one piece, of potato. Put in our very own two mealworms. Then secure the lid on. Each student will make this kind of a mealworm habitat and keep it right on their desk to observe over time.

Four students in a group can put their vials in a strawberry basket to form a corral so they won't knock the vials over. Each student gets a copy of *Life of a Mealworm*. They record the day they got the mealworm on the calendar and then they can draw and write some of their observations.

Student: Look; look. They're just playing.

Narrator: Towards the end of Part 1 you'll want to set up a class mealworm culture in the clear basin. Add some bran to the bottom of the basin and then add all of the extra mealworms that you have that are not in the individual student vials. A little bit of potato should be added for moisture. And the students can observe the changes that occur in the class culture as well as in their own individual vials. The teacher marks on the class calendar the date the mealworms arrived. And that concludes Part 1.

<Investigation 1, Part 2>

Narrator: Part 2 can take anywhere from two to four weeks. The materials that you'll need to get from the kit include the posters which you make copies of from the duplication masters. You also want to get some chart paper and a pen for recording class observations over time: observations of structures, behaviors and changes in the mealworms.

Over the two to four weeks that the students have their mealworms, they will be seeing lots of changes or life sequences. One thing they'll notice is that the mealworm changes color. It turns white. That happens when the mealworm molts its skin. Mealworms, like all insects, molt in order to grow.

The students may observe some tiny orange granules in the bottom of the vial. They often think that those are eggs. But they are not. And you can suggest that if they are not eggs, they might be something else that the students can think about. They are the droppings of the mealworm. First and second graders refer to these droppings as mealworm poop.

The students will then observe that their mealworm changes into a different form. Some students may think that their mealworm has died because it's not moving. It looks like a little ghost. That's when you can bring out the pupa poster and introduce that term, pupa, as a resting stage of the life sequence of the mealworm.

Finally, the students will observe that the pupa changes into an adult beetle, the darkling beetle, or the tenebrio beetle. The students will be able to observe the adult beetles over time. Their observations will be heightened if they use a hand lens on a vial and create a bug box. It just so happens that this vial and this hand lens have a perfect match so by putting a mealworm or beetle on the bottom of the vial, slipping the hand lens on the top of the vial and looking straight down, you're right in focus.

As the students observe the adult beetles, you want to call to their attention the distinct body parts of the adult insect. They have three parts, "the head, the abdomen and the thorax. You can

draw it on the board and have the students draw it so they can identify these three different parts.

There are a number of ways to help the students record their observations. You can have them do that in their own individual booklets or journals. You should also use the What We Learned chart to record for the class observations, ideas and student questions.

And at the end of each investigation use the Summary Life Cycle chart to record the structures and behaviors of the insect at each stage in the cycle. You can use these same techniques for the other insects. We may not mention them in this video, but they can be used: the booklets, the drawings, and the class chart.

Student: Insects.

Narrator: Now that the students have this experience with these concepts, you can introduce the FOSS Science Stories. Students get a lot more out of reading material when the subject matter is familiar.

Student: Can you think of some others . . .

<Investigation 1, Part 3>

Narrator: Part 3 is called life cycle. And if you're lucky, you'll be able to observe it along with your students in the classroom. We suggest that you establish an adult beetle only habitat in a clear basin like this one here. Put some bran in there, provide potato for moisture and just let the beetles do their thing.

After about two weeks or three weeks, ask the students if they think there might be anything else in there with the adult beetles. Scoop up some of the bran, put it in the cup and distribute it to the students on a paper plate or on a sheet of paper. Then ask them to observe very closely. At first the students will say that there's nothing there. But invite them to look closer and then they'll exclaim that there are baby mealworms in there. And here for comparison is a newly hatched baby mealworm and another mealworm that's pretty well along his life cycle and probably will pupate shortly.

Ask them where the baby mealworms came from. And then you can engage them in a discussion about the adults mating, laying eggs, the eggs hatching and the little baby mealworms coming out. At this point the kids will want to establish a new habitat in a vial for their baby mealworms. And that's perfectly fine. You can do that. Another thing you can do is just put the baby mealworms back in with the adults and keep them as an ongoing culture.

When you have to pack up the equipment and put it back in the kit to pass it on to another classroom, you can maintain the culture in a separate plastic container. Something like this one. This one has been going on for years. We add more bran, more potato on a weekly basis and just let the complete life cycle go on.

We've got adults. We've got pupa. We've got larva. There are eggs in here. But they are so tiny you can never really find them. There are droppings in there. Everything is in there together. And they live very happily. This can go on for years.

So that's what might happen in your classroom with mealworms over ten weeks. Here are the concepts that students have been introduced to in Investigation 1: Insects need air, food, water and space; insects have characteristic structures and behaviors; the life cycle of the beetle is egg, larvae, pupa and adult, which produces eggs.

But remember, you haven't had just mealworms in your classroom. The students have also been observing and caring for wax worms, milkweed bugs, silkworms, painted lady butterflies, crickets and maybe ants. The students are going to be able to compare one insect to another, compare their structures and compare their behaviors and look at the changes, both the similarities and differences between the insects. So let's take a look at the second insect in the module.

<Investigation 2, Part 1>

Narrator: In the second activity, the students investigate wax worms. Now, wax worms are the larval stage of the greater wax moth. As an adult, the moth invades beehives -- weak beehives, usually, not strong beehives -- lays its egg in the beehive. When the larva emerges, the larva eats the honey and the wax and then grows and grows and pupates and turns into the adult.

Now, we selected this organism because as a larva, it's very similar to the mealworm but it does have some differences. And of course, it turns into a moth, not a beetle as in the mealworm. There are some other interesting things about this organism. Like all moths, it spins silk. And the students will be able to observe that. They will be able to see the silk, hold the wax worm up by the silk. And that will be very interesting to them. And of course, the students can easily handle this organism. An organism that the students can hold in their hand are always good ones for them to investigate.

Let's take a look at the equipment that you'll need for this activity. In Part 1 you'll need for each group two plastic cups, one cup lid, one label, one push pin and a pair of hand lenses. You'll need for the class a pair of plastic forceps and a bottle of glycerin.

You'll need to provide a pair of scissors, some half sheets of paper, a marking pen, some sugar, some baby cereal, a roll of chart paper and a cardboard box, a shoe box or maybe something a little bit larger. And most importantly, you'll need to get the wax worms.

Let's talk a little bit about wax worms. Check the Teacher Guide, the material section, and you'll see some locations, some sources, on where to get them. You can get them from biological supply houses or you can sometimes get them from bait stores. The ones that I have here in my hand in this jar came from a biological supply house. There are about 75 to 100 of them in here and they come packed in their food source. I'll tell you a little bit more about that and how to make it in just a minute.

But let's take a look at this. When they come, the lid has some tiny holes. They will be just fine in here. That's one of the nice things about wax worms, you don't have to worry too much about caring for them. They'll be just fine. But you do want to see what size they are. The bigger they are, the better they are for the students to handle.

So you can just dump this right out. The food source never spoils. It has a pleasant odor. And it's also nice to handle so there will be no problem.

I'm going to search in here. And this is what you're going to do shortly before you're going to be using them with the students. You want to find those wax worms. Sometimes they are way down here. So I'm going to spread them out and see if I can find some. Oh, here is one. This is what they look like. And this is a decent size for the students. If they are much smaller than that, they will have a hard time with them.

This one is not being very active. Usually they are very active. Ah, there he goes. So that's the wax worm that the students will be investigating.

If the wax worms arrive in a tub of sawdust rather than nutrient median, remove them immediately and put them in the plastic jar supplied in the kit along with the median you prepared. The jar lid comes with tiny air holes.

And now I'll show you how to make your own wax worm food. And you'll have enough to supply the wax worms as long as they live in your classroom. This is what you'll need for the recipe, these ingredients: You'll need glycerin, sugar, water, and baby cereal. Begin by dissolving three-eighths of a cup of glycerin and one-quarter of a couple of sugar in one-quarter of a cup of water. Get it nice and hot. Then take that liquid and slowly pour it into a whole box or -- a box of cereal you've dumped into a bowl.

Pour the water into that and mix it vigorously for quite some time. That's all you need to do. Then take that food and put it into a Ziploc bag. No need to refrigerate it. It will just be fine.

This is what the finished product looks like after you mixed it thoroughly. What I have here in this plastic bag is about half of the total volume you'll have after you make a full recipe. I've used some of this. So you'll have a little bit more than that. But this is what it looks like.

Begin Part 1 by introducing the wax worms to the students. The easiest way to distribute them is give each group of four students one cup containing four wax worms and then you'll provide an empty cup for each group. The students often like to use the cups to turn them upside down to kind of contain the wax worms as they crawl around on the table. Also give them a half sheet of paper. Each student gets one and each pair gets a hand lens so they can closely observe.

Caution them to be careful, to be respectful, of the living organisms but to try to find out all they can about the wax worms. As the students work with the wax worms in the classroom, they will make many observations. They'll see that the wax worm larva are white or tan, that they are quite plump and they are clearly segmented with 13 segments. They move very fast, sometimes faster than the kids like.

They are softer than the mealworms so they must be treated somewhat more gently. But they are still very easy for the first and second graders to handle.

The wax worm has the mandatory six legs like all insects. But unlike the mealworm, which is a beetle, the wax worm larva has four pairs of leg like structures called prolegs, one pair on the abdominal segments three through six. These prolegs are equipped with muscular pads called claspers. And it helps the larva to hold onto surfaces like paper that the students might be handling.

The tail also has a clasper. The students will be able to see that. And the students will be able to feel the bristles or stiff hairs along the wax worm body. Wax worms like all moths, make silk. The silk is used as a life line, as a webbing, over which they can walk and as a material to build a protective cocoon. The silk is produced in a gland under the head and extruded through structures called spinnerets.

The students won't be able to see exactly where the silk is coming from. But they'll see it comes from the head. And they'll be able to feel it. Encourage the students to investigate the wax worms in any way they can think of as long as it doesn't bring harm to the larva.

Bring Part 1 to a close by telling the students that they can keep their wax worms but they'll need to provide some things for them. They'll need to consider the wax worm food, water, space and air. Suggest that they can keep the wax worms in the cup. That will be the space. You can give them a lid and suggest that they can punch some holes in the lid for air. They can do that with a push pin. That takes care of the air.

Now, for food and water, provide the mixture that you made ahead of time with the baby food and sugar. That will provide all the food and water that the wax worms need. Each group can fill their cup about a quarter full of food, put their wax worms in and then put the lid on. They should also take a label and label their cup with their group name or number so that it can be identified.

We suggest that you take a box and put all of the students' cups in a box. That will keep the wax worm in a dark environment which they prefer. And it might stay a little warmer, as well. If your room is cool, put a lamp over the box to provide warmth for the wax worms. Any wax worms that weren't distributed to the groups can remain in the class culture. And that brings Part 1 to a close.

<Investigation 2, Part 2>

Narrator: In Parts 2 and 3, the students will observe the development and life stages of the wax worm. Here is the equipment that you'll need for these parts: From the kit you'll need to get the large plastic container with the lid. Students will need to have hand lenses to observe the wax worms and you'll need the wax worms, both the student group cultures and the class culture.

You'll need to provide wax paper. Now, it's hard for me to tell you exactly what's going to happen in your classroom. Sometimes the wax worm larva stay larva for a long time. Six, eight, maybe ten weeks. Their growth is very temperature dependent. They like it hot. Very hot. Hotter than most classrooms.

So don't be dismayed if they remain a larva for a long time. The students will still be able to compare that larva to the mealworm larva. But given enough time and enough heat, the larva will eventually spin a cocoon and pupate. Let me show you what that looks like.

Here is a cup. And on the lid there are some cocoons. I'm going to open the lid. And I'm going to take one of these off and pull out the pupa so you can see it. I'm going to take this pupa out of the cocoon just to show you what it looks like. But you won't want the students to do this. You may want to do one for them so they can see it. But the others you'll want to leave inside the cocoon.

Eventually the students will see the adult moths flying around in their cup. They've emerged from the pupa stage. And it's at this time that the students should remove the adults from the container that has the food in it and put the adults in a clear cup. They can keep them for a day or two and observe them.

This is what the adult looks like. It's a little non-descript moth. Don't worry if it gets away. This is not the moth that eats holes in your fine wool clothes. But do keep a lid on as much as possible.

After the students have observed the moths in the clear container, it's time to put all the groups' moths into one big glass container. They can just dump the moths in here. They don't need food or water again. But what they do need is a substrate for egg laying. Because that's one thing that adult moths do, they mate and the females will lay eggs.

So you can take a small piece of wax paper and fold it into a fan. Something like this. A very tight fan with lots of little ridges and corners. Drop that in with the adult moths. They will lay the eggs on the wax paper and you'll be able to see them, white little ribbons of eggs.

When you see those eggs, then it's time to take the wax paper out and put it into a container that has a food median. And when the eggs hatch, tiny, tiny little wax worms will emerge. That's when you can introduce life cycle to the students.

Here is one of the series of posters that shows the wax worm life cycle. You can hang these up for the students and review the various stages. It's also good if you put these posters up against the mealworm posters so that they compare the life cycle of those two organisms. Here are the concepts that students have been introduced to in Investigation 2: Insects have similar structures and behaviors; wax worm larva produce silk.

<Investigation 3, Part 1>

Narrator: In Activity 3, the students investigate milkweed bugs. Now milkweed bugs are true bugs. They are not butterflies. They are not beetles. They are true bugs. And this is the first bug the students have investigated. And like all bugs, it goes through not complete metamorphosis but incomplete metamorphosis. This is quite different from the mealworm and the wax worm larva that the students have observed before.

The milkweed bug starts from an egg. When the egg hatches, a tiny little bug emerges. The bug grows, goes through five instars, molting each time, and emerges as an adult. These milkweed bugs that your students will be working with are found in the wild. But these have been particularly raised in a laboratory for laboratory use and classroom use. In the wild they eat milkweed seeds. But these eat only sunflower seeds. That makes them particularly easy to take care of in the classroom. The students will be able to compare the life cycle of the milkweed bug to that of the wax worm larva and to the mealworm that they've already observed.

Here is the equipment that you'll need for Part 1 of this activity: From the kit you'll need to get vials with lids, one for each group of four students, a label for each vial, hand lenses for pairs of students. And you'll need the paint brush that is in the kit. You use that to transfer the eggs to

the vials.

In addition, you'll need to supply for yourself one piece of paper for working with eggs and you'll need to order the eggs. You'll need to order the eggs just right before you're going to do the activity. The eggs will arrive and they will hatch within about three or four days. So timing is critical here. The eggs must come from a biological supply house. You can't get these eggs locally. So plan ahead, order them. And plan to use them as soon as they arrive.

Let's take a close look at the eggs. This is what they look like when they arrive. They are orange tiny little eggs. And they are sitting on some fibrous cotton. There are a lot of them in there. And what you need to do is to divide those eggs into eight parts and put one part in each vial.

I'm going to show you how to do that. Take out this cotton here. And what I'm going to do is I'm going to tease it apart so that some of the eggs -- in fact, I want all of the eggs to fall onto the paper. You can see them getting on there. Once all of the eggs are on the paper, then you can separate the eggs into those eight groups so that you've got equal portions. Take one of those portions, scoop it up with the paint brush and put it in a vial. That's all you need to do. That's the preparation for starting Part 1.

Part 1 is a short session. Tell the students that you have some new insects for them to observe. And then give each group a vial with some tiny yellow round things in there. You can give each pair of students a hand lens and invite them to take a close look. Don't tell them what they are. Invite them to speculate, to guess what they might be and what they might change into.

Each group will be able to keep their vial. They'll need to label it so provide a label. And they can put their identification on the lid. The students can either keep their vials at their desks or if they feel they might not be safe there, you can put them on a side counter where the students can observe them each day.

<Investigation 3, Part 2>

Narrator: Part 2, Milkweed Bug Habitat, starts a few days later after the students have observed that tiny little bugs are crawling around in their vials. This is a time when the students will need to set up habitats, one for each group, and put their tiny bugs inside the habitats to observe over time. Let's take a look at the equipment that you'll need for this part.

Each group will need their vial of bugs and eggs, a label, pair of hand lenses, a large Ziploc bag, ball of cotton, piece of netting cut to about ten centimeters by ten centimeters, a vial with a lid, sunflower seeds -- the sunflower seeds in the kit come already shelled -- rubber bands, a push pin, a piece of cardboard. That's what each group will need.

And these are the tools that you'll need during the activity: You'll need a paint brush, a wooden dowel with a pointed end and a hole punch. The materials you'll need to provide include jumbo paper clips, a pair of scissors, some absorbent paper towels and some twigs.

In this activity each group of students makes a milkweed bug habitat. You'll need to demonstrate this to the class so practice making one ahead of time. Let me show you what's involved.

You need to consider the space for the bugs. And this is the space we're going to put them in, this one Ziploc bag. And they need some air. So we're going to take a push pin. And we're going to put a bunch of air holes towards the top. And that's with what this cardboard is for. Kids can just poke into the cardboard not damaging their desks or their fingers, and get a bunch of holes up there. We have space and we have air.

Now, to improve the space so that the bag doesn't collapse on us, we're going to put some twigs in there and make a small branching tree. We're going to get some twigs. And see if they are going to fit in there. These I'm going to have to break off just a little bit. Keep in mind that each collaborative group is going to make one. And each student in the group will be assigned one of the responsibilities. So one of the students will be making the tree.

We're also going to take a little bit of cotton. Spread it apart a bit and put it in that tree securely. Now, let me see if it's going to fit inside. Very good. Okay. I'm going to take it back out right now.

Space and air is taken care of. Now we need to consider food. Milkweed bugs eat only one thing -- these milkweed bugs -- sunflower seeds. So one of the students has to take a bunch of sunflower seeds, crack them and get the seed out.

Now, this might be quite a long job so other students can help out with the shelling process. This little piece of netting is going to hold all of these seeds. And I'm going to catch them all up in the netting, take a rubber band and secure the netting with the rubber band. Watching kids put rubber bands on the netting is an interesting process. Now, this food package can be put right on one of the limbs of the tree. Up top is good.

There's one more thing we need to consider. And that's water. We're going to make a fountain using this vial. Take the vial. And you'll probably need to do this for the students. Punch a hole in the center of the lid with the hole punch. Then cut a small piece of absorbent paper towel just big enough to fit in that vial with some hanging out the top. And roll this into a tube. You might twist a little bit and then put the paper towel through the lid. Let's check size here. Oh, that's going to work just fine. We'll fill that with water. The wick will stay wet and that's how the bugs will drink by coming to the wick on the vial.

Now, we have to put this fountain inside our habitat. This is one of the trickiest parts. I'm going to take the bag. And this is a job that you, the teacher, will do for each group. Take the wooden dowel with the point. And you want to make a hole in the bottom off to one side a little bit. Just push the point through and pull the dowel out.

After you fill your vial with water, then you put the bottom of the vial towards that hole and then press. It will make a nice tight seal and the bugs will have water. And that will be hanging down like that. You do need to fill it with water before you put it in. And that amount of water in that vial will take care of the bugs probably for a month or so.

Let's put our tree in. One thing you want to be careful of is you don't want the branches of the tree to be touching the wick. Because then they will absorb the water. You don't want that.

The last thing that we need is a support system to hang the bag. So what we use is a jumbo paper

clip. You can open it up, put the paper clip through the bag. And now you've got something that you can hang onto a push pin in the wall.

Part 2 begins with the students observing the vials. They'll see some eggs in there but they might see some other things moving around. Let's listen to some of their conversations.

Student: It looks like little animals.

Student: See.

Student: They look like spiders.

Student: They are not little spiders.

Student: They are like those things on the package.

Student: Did you see the little tail?

Teacher: Are they still in there?

Student: Yes -- no.

Teacher: Did anything happen to them?

Student: Yes.

Teacher: What?

Student: They turned into little bugs. See on the box. They got the little red tail.

Teacher: Now, are some of them still eggs and some of them little bugs?

Student: Are the bugs still in the egg?

Teacher: Look closer. See if you can see anything that's still in the egg.

Student: Oh, yes.

Student: It looks like it is the bug.

Teacher: That's a good indication that there is some in there and ready to come in.

Student: One is all red. See it? It's all red.

Student: That one is a different color. Is that yellow?

Student: Uh-huh.

Student: Maybe not orange but something else.

Student: Is that like a black?

Student: Do you think they can fly?

Narrator: Identify the milkweed bug. Tell the students that the insects in their vials are milkweed bugs. They hatched out of those little orange eggs. Baby milkweed bugs are called nymphs. And the nymphs are going to live in the classroom. And we'll learn more about them.

At this point you'll want to review the basic needs of insects and then demonstrate for the students how to assemble the habitat. Organize the students into groups. And in each group one student should take one job responsibility. One takes care of the space. One takes care of the air. One takes care of the water. And one takes care of the food.

They will need help doing some things. They will need help installing the water supply. You'll need to come around with the dowel and help them do that.

When it's time to introduce the milkweed bugs, tell them to dump the bugs vial and all into the bags. They might want to try to get them out of the vial. But it's okay to put the vial right inside the bag.

Students will label their habitats with their group number. Give them labels to do that and then find a place in the classroom where they can hang up the habitats, a place where the students can easily observe the bugs moving around. You want to be sure that they can see them several times during the day, that it's not difficult for them to get at them.

One other thing about location, the milkweed bugs do enjoy sunlight. They seem to be very active in the sunlight. You don't want them to get too warm. But if you have a place that gets afternoon sun, that would be a good place to put them. If you're keeping a class calendar, this is the time to record the arrival of the milkweed bug nymphs. And this brings Part 2 to a close.

<Investigation 3, Part 3>

Narrator: In Part 3, the students observe the milkweed bugs grow and change over time. There's no new equipment that you need for this part. But we do have some posters that you can use. Bring the posters out when the students observe the changes.

We've got one called Milkweed Bug Stages, Milkweed Bug Male and Female and Milkweed Bug Pictures. Milkweed Bug Pictures is actually one that the students can color in after they can tell the males from the females.

Here is a milkweed bug habitat that has been going for, oh, about a month or more. The students will observe many things in their bug habitats. They may see that there are some black things accumulating on the bottom of the bag. They sometimes refer to these as black spiders. That's kind of what they look like. But there aren't any spiders in this bag so you'll want to ask the students what else they might be.

And the students might notice that at one time one of their milkweed bugs turned quite orange

and even had orange legs, not black legs. You want to help the kids think through the fact that these milkweed bugs need to shed their skin. They need to molt in order to grow. And what those black spiders down at the bottom really are the milkweed bug molts. And those will accumulate over time.

The students will observe the milkweed bugs drinking from the fountain using their beak to get water. They will see them on the sunflower seeds also using their beak to get the oils from the seed. And the students may observe the seeds shriveling over time. You may even need to add a new little net full of sunflower seeds after three or four weeks.

They may observe the milkweed bugs cleaning their antenna, washing their antenna. There is one doing that right here now. I can see him. Students may see the adults mating. They mate for long periods of time. So the likelihood that your students will observe that is great.

And they may even see them lay eggs. The females lay eggs in the cotton. There's some eggs in here.

Now, one other thing that the students will see is that the bag will get dirty. There's little brown spots on this bag. And over time, the bags might get quite dirty. Those are droppings from the milkweed bugs. And if the bag gets too dirty, you can build a new habitat and transfer all of the bugs from this bagging into a new habitat.

One question we often get is: How do you refill the vial when it needs more water? Well, the only way to really do that is to take the vial out. Either make a new wick or just add water and put the vial back in. And that's not too hard to do because these milkweed bugs, although they have wings and they can fly, they don't fly very well. And usually they just drop to the ground. It's perfectly fine to open the bag and have the students hold the milkweed bugs, have them walk on the table. That's no problem.

So taking the vial out shouldn't be a problem, either. Let me show you how you can do that. What I'm going to do is get a box just in case any of them get away. I'm going to stand up for this. And I'm going to open the bag. And when you open the bag, the milkweed bugs tend to drop down. That's their defense mechanism. When they are frightened, they drop down.

Now I'm just going to reach my hand down in here. And I'm going to pull this vial out. Now I have a bug crawling on my hand. That's no problem. It's so light I can't even feel him on my hand. But I'm going to shake him back down into the bag. And the only thing you have to worry about is making sure that the hole down here doesn't let any escape. But this is going to be fine.

So I can even set this bag down, go change the water. And then when I'm ready to put the new vial of water in, just open the bag and reach down in here, find that same spot and push the vial in and close it back up. Oh, I got another one on my finger. Brush him down. And only one of them got away. Here is one that crawled out. I can put him back in. Now, this is a job that your students will love to help you with.

And we're all set. So that's how you change the water or add water to the vial. There is a modified water fountain that allows you to add water without removing the water from the bag. You use a syringe to add the water through to the vial through a tube. Read the Getting Ready

for Part 2 for the details on this system.

Here you can see in this habitat the adults have laid eggs. The adult females have laid eggs. Those eggs will hatch in maybe a week or so. The young nymphs will emerge and they can go through their entire life cycle in this milkweed bug habitat. This activity will never end if you don't want it to.

Here are the concepts that students have been introduced to in Investigation 3: Insects hatch from eggs; insects have three body parts: Head, thorax and abdomen; insects have different structures for eating different kinds of food; some insects go through simple metamorphosis (egg, nymph, adult.)

<Investigation 4, Part 1>

Narrator: The fourth activity is called Silkworms. The organism that the students investigate in this activity is the same one that produces the silk fiber used to make fine commercial silk fabric. This organism has been domesticated for over 4500 years and can't survive on its own. It relies on humans to provide it with protection and food.

This organism is probably one of the best organisms for students to investigate. And here are some of the reasons: The students can see it go from egg to larva to pupa to adult. They can see all of those stages clearly occur. The larva is very large and it moves very slowly. The adult doesn't fly and the students can also handle it very easily.

Another advantage is that you can save the eggs that are laid by the adult, stick them in the refrigerator and use them again next year. So it's an easy organism to maintain year from year. There are a couple of disadvantages. This organism eats only one thing, mulberry leaves, fresh mulberry leaves that you need to supply. You can only get them between the months of April to October, maybe November. So you have to plan to do the activity during that time.

Not only do they eat mulberry leaves but they eat voraciously. And you have to feed them on a daily basis, actually several times a day during certain stages of their life cycle. So you can't leave them during vacation. You can't even leave them at school on the weekends. You have to make sure that they are fed every day.

If you use eggs that you've saved and stored in the refrigerator, plan to take them out two to three weeks before you'll need to start the activity. If you order them from a biological supply house, plan on starting the activity within a week after the eggs arrive. Then you'll be ready to start Part 1.

These are the materials you'll need from the kit for Part 1: Each group of students will need a vial, a label and two hand lenses. For the class you'll need a brush to transfer the larva and the class calendar. You'll need to provide the scissors to cut the labels as before, a marker for the calendar and most importantly, the silkworm eggs. These I took out of the refrigerator two weeks ago.

Here is another way to store eggs. I took these out of the refrigerator a couple of weeks ago, too. They are from last years' container that's been cut up and put in plastic bags. Eggs are stuck right onto the cardboard.

To prepare for Part 1, tease off some of the silkworm eggs by bending and tearing the cardboard or the egg carton that they are stuck onto. Get about ten or so eggs onto a piece of paper and transfer those to the vial. You'll need to prepare a vial like this for each group of four students.

Now you're ready to begin the activity. Give each group a vial and two hand lenses. Ask them to look closely and see what is inside the vials. Tell the students they will be able to keep the vials and see if anything inside changes. Give each group a label so they can identify their vial and then have them secure the vials in a safe place.

<Investigation 4, Part 2>

Narrator: Part 2 begins when some of the larva have hatched out of the eggs and the students can actually see the larva moving around inside the vial. These are the materials you'll need: You'll need the vials with the eggs and larva, a hand lens for each pair of students. For the class you'll need a brush to transfer the larva to the habitat. And for each student you'll need a record sheet, the insect record sheet, and the cover *Life of a Silkworm* if you choose to use those.

These are the materials you'll need to supply: You'll need to get a nursery for the young larva, either a cardboard box like this one with a plastic cover over it or a margarine tub with a lid. You'll also need to get the mulberry leaves. I've got a bag here. And I'm going to keep them in the refrigerator until I need them. You'll also need a pen to record on the class calendar and some chart paper to record students' comments on silkworm structures and behavior.

You'll need to locate a mulberry tree to provide the leaves for your silkworms. If you don't know where one is, check around, ask some people at your school or in your neighborhood or go to a nursery and ask them to help you find one. Once you identify what a tree looks like, a mulberry tree, you'll see them everywhere.

Begin the part by asking the students to get their vials and to see what's inside. Then call the students to the rug and discuss their observations.

Teacher: I want to ask you some questions about the vials. Now that you've looked at them, what are some of the things that you saw in the vial? Let's see. What did you see?
Karli?

Student: I saw eggs.

Teacher: Eggs? Can you describe the eggs?

Student: They were real small and they have kind of gray dots.

Student: No, black.

Teacher: Small and have kind of gray dots?

Student: Yeah.

Student: Mine was climbing up.

Teacher: You mean it was climbing up the vial?

Student: Yeah. It wanted to get at the top.

Teacher: You think it wanted to get at the top.

Student: It has teeny little legs on it.

Teacher: Raise your hand if you saw those little teeny legs. We're looking at how many legs that tiny thing had in there. They are kind of dark and black. That has a special name. That's called a larva. Can you say that word?

Class: Larva.

Narrator: Review what all organisms need in order to survive.

Teacher: We need to make a habitat for our larva, where our larva can grow and live and be safe. And some of the things we need to have in that habitat --

Student: Some leaves.

Teacher: We need to have some leaves. That's right. And we need to have a special kind of a leaf. But that larva only eats a very special kind of a leaf. They are leaves from a mulberry tree. And that larva is a silkworm larva. And it's the only food that it eats. So we'll have to put the leaves in a special place where the larva will be safe.

Narrator: Introduce the habitat and describe for the students what they'll need to put inside. They will need to put some of the leaves -- the mulberry leaves, you'll need to pass them around so the students can see them and feel them. Then put some of the leaves inside of the box, inside the habitat, and have the students come up a couple of groups at a time and transfer their larva and the eggs into the habitat.

It's okay if the eggs are spread around the box. But try to get the larva onto the leaves. A brush will be handy for that. Then put the habitat in a place where the students can observe it over time. Make sure you cover it. The covering is to prevent the desiccation of the leaves so they stay humid. But you don't want to create too humid of an environment for the silkworms. They like it dry. But the leaves need to stay moist so you need to compromise there.

If you want at this point, you can introduce the Life of a Silkworm Booklet and have the students record something about their small silkworms on the insect record sheets.

<Investigation 4, Part 3>

Narrator: Part 3 begins when the silkworms have reached a length of about two centimeters. Prior to that time it's better to keep the young larva all together. They do better that way. But now the students can make a silkworm habitat and groups can have them on their table to observe each day.

These are the materials you'll need for this part: You'll need a silkworm habitat sheet for each group of four students so that they can make their silkworm habitat box. You need a plastic bag for each habitat. And for each pair of students, a hand lens. These come out of the equipment kit.

You'll need to provide transparent tape, more mulberry leaves and the silkworms in their habitat. And here they are about two centimeters long. These are actually a little bit longer.

The first thing you'll want to do is to demonstrate to the students how to make the silkworm habitat. Let me show that to you now. Have them put the writing down on the table. And then fold the sheet of paper along each of the dotted lines here. Remember, each group of four students will make a habitat for their group.

Okay. Now we're going to open it up. And this part is kind of tough for young students. Have them bring the walls -- two walls of the habitat up. And they will see that there's this part sticking out. You need to crease that and fold it over. You need to put a small piece of tape over that. Do that again. Bring the two walls up, crease the side and bring it over. Put a piece of tape on that. We'll repeat it on the other side. Let me do it with the other side, as well.

Looks are not too important here. Children just need to be satisfied with it. And you don't have to worry about the silkworms crawling out. They won't do that. They will stay on their leaves.

Now you go around and give each group a few leaves and evenly distribute the silkworms so there are about four silkworms in each habitat. The students can observe them and watch them eat. And then the last step is to put the silk worm habitat inside the plastic bag.

You don't seal the bag. You leave it loose like that. But this will again help to retain the moisture in the leaves.

This is what sits on the students' desks. And they can make observations daily. They can take their silkworms out. But if the students start playing too much with the silkworms, you might want to have them remove the habitats to a central location.

Student: He tickles; he tickles. Put him on your hand. He tickles.

Student: Tickle, tickle, tickle.

Student: Watch. It's so funny.

Student: Tickle.

Student: Don't bite me. Mmmmm . . . that's a no-no. You go in the box.

Student: Okay.

Student: Let's put him it in the bag.

Student: Don't close the bag.

Student: I'm not.

<Investigation 4, Part 4>

Narrator: Part 4 is called silkworm structure. Now, this is the third larva that the students have investigated. They looked at mealworm larva, wax worm larva and now the very large silkworm larva. So this is a good time to have them take a close look at the structures and to identify those structures and attach the language associated to all insect larva. The process that you go through is described in the activity folio.

Start off by introducing the term segment and ask the students to count the segments on the silkworm. They will count 13. Then you can draw on the chalkboard 13 segments as shown here.

Ask the students to look at the first segment, the head. And see if it's the same size as all of the others. They'll say no so you want to modify your drawing so that the first segment, the head, is a little bit smaller.

Then ask the students to look at the second segment. They'll see that the second segment along with the third and fourth are larger and they are the segments that have a pair of legs on each one for a total of six legs. You can introduce those three segments as the thorax. The thorax always has the walking legs. All the rest of the segments form the abdomen. From the end of the thorax all the way back to the tail, that's the abdomen.

Now, ask the students to take a close look at the abdomen. And they will see that there are some leg-like structures on 7, 8, 9 and 10 segments. Those are called prolegs. They are not true legs. They are prolegs. And they have little claspers on the end. They help the silkworm to attach to things.

Students will refine their drawing and help you refine your drawing by adding things like the false eye on the third segment. The spiracles or dots on each segment. That's how the silkworm breathes. They'll see the point back here near the tail and a couple of claspers at the very end.

You can ask the students to see if they can figure out where the silk comes from on the silkworm. You'll have to have them take a look at the silkworms on their desks and see if they can identify where the spinnerets are. The spinnerets are close to the head right up here. And that's where they will find the threads of silk coming from the silkworm. After you and your students have completed the chalkboard drawing, you can end this part by displaying the silkworm larva poster.

<Investigation 4, Part 5>

Narrator: Part 5 begins when the larva are three to four weeks old and they've gone through their five instars and they are ready to spin their cocoons. These are the materials that you'll need: You'll need those mature larva. These are the -- these are the larva. They are about ready to start spinning.

You'll also need a hand lens. And the materials you'll need to provide include a sheet of paper to line the box, more mulberry leaves -- always more mulberry leaves -- an egg carton and a box.

There will be a lot of excitement in the classroom when the student observes the first larva spinning its cocoon. That's your cue that all of the silkworms should then be put into a different habitat. The habitat will be the box. You'll get a piece of paper to line the bottom of the box. The egg carton will serve as a structure, a substrate for the silkworms to spin. You'll want to attach that securely inside.

Then have all of the students bring their silkworms and leaves. Put them inside the box. You'll want to provide plenty of leaves. You can leave it open. At this point the silkworms are so big, they will eat the leaves so quickly, you won't need to cover this with plastic. Then over the next week you'll see all of the silkworms spin. Students might even be able to watch it in progress.

Student: It looks like spider webs.

Student: Well, it looks like spider webs but it's not.

Student: Then how do they climb up?

Student: They spin it almost like spiders.

Narrator: This is what the pupa or cocoon of the silkworm looks like. Usually they will spin white silk. But occasionally you'll have one that's yellow. I don't know why. But they will be viable.

You can also introduce the silkworm pupa poster at this time. Put it up on the board so the students can see it. In about two weeks the adults will emerge from the pupa and again it will be great if the kids can watch this. The adults look different. The males are a little bit smaller and have longer antenna. The females are a little bit bigger in the abdomen.

The adult silkworms don't need food or water. They have only one purpose. And that is to find a mate and for the female to lay eggs. The female will lay hundreds of eggs. And the students will be able to see the female doing that. The eggs will stick to the cardboard and to the paper on the bottom of the box. That's what you can use to then cut up and put in a plastic bag and save in your refrigerator for the next year. Display the Silkworm Adult poster and the Silkworm Stages poster and review the life cycle of the silkworm.

Here are the concepts that students have been introduced to in Investigation 4: Insect larva have structures in common; insect adults have structures in common; male and female insects mate and the females lays eggs, moths pupate in silk cocoons.

<Investigation 5, Part 1>

Narrator: Activity 5 is called Butterflies. Your students may be very familiar with the adult stage of the butterfly. But they may not know what the larval stage looks like. That's what they'll have a chance to investigate in this activity.

Now, this is a class project. We don't have enough larva for every individual student to have. But they will be able to enjoy it as a class project. You'll need to order the larva. They come in a container that looks like this. Five or six larva in one container and plenty of food for them to

go through their life cycle.

For each pair of students you'll need a hand lens. For each student you'll want to make a Caterpillar Structure sheet for them to record their observations. And for the class, make one Painted Lady Class Journal.

Start the activity by introducing the container of larva. The students will identify them as caterpillars. And you can add that they are Painted Lady larva. When they are small, the students shouldn't handle them. They can only look at them in the container. But when they are about a week old -- well, maybe about a week and a half, you can let the students at a center handle the caterpillars and observe their structures. This is a time when you might have them complete the Caterpillar Structures form.

Encourage the students to watch the larva and observe for molting, silk formation and pupation. The larva, when they are ready, will climb to the lid of the container and form into a J shape and pupate. That's when you want to go onto Part 2 of the activity.

<Investigation 5, Part 2>

Narrator: Here are the materials you'll need for these parts: Go to the kit and find the butterfly cage. It comes in parts. There are four wooden dowels, two plastic platforms, a net and a vial holder. Also get one vial with a lid, the hole punch and a plastic clear cup with a lid.

These are the items that you'll need to provide: Sugar, transparent tape, Painted Lady pupa, sheet of paper to line the bottom of the butterfly cage, absorbent paper towel to make the wick for the fountain. And you'll need to find some mallow. This is optional. But if you can find it, that's great.

I recommend that you practice assembling the butterfly cage ahead of time. You'll do it in the classroom with the students. But do it once by yourself. This is how it goes: Put a wooden dowel in each of the depressions. Push them in firmly. Now, put the other platform down and turn it upside down. And once again, push the dowels into the depressions. Okay. Things are taking shape.

Now, find the net. The net has an opening on one side. And push the net over the cage frame. Turn it upside down. Pull the elastic on top so that it's nice and secure. Let me turn it around so that you can see that there's an opening here that I can put my hand in. But it won't allow the butterflies to fly out.

Now you'll need to make a fountain. This is the vial holder. Just like we did before, punch a hole in the lid, put in a paper towel wick. But this time, instead of using water, we'll use a sugar water solution. The adult butterflies need sugar water as their nectar source.

Now, this vial will go in that holder. And then I can put that holder right in there. But before I do that, I want to line the bottom of the cage with this paper. And then I can put in -- now we're all ready to go.

If you can find some fresh mallow, that will be great for the adult butterflies to lay their eggs on. Get a plastic cup with a lid, poke some holes in the lid of the cup so you can stick the stems of

the leaves through there. Add some water. And now you can put that inside the butterfly cage, as well.

<Investigation 5, Part 2>

Student: Look at those.

Narrator: Begin Part 2 by having the students observe the Painted Lady pupa and identify it as a chrysalis. Suggest that it's now time to move the chrysalis from the container into a more suitable habitat. This is a time when you bring out the butterfly cage and assemble it for the students.

Then you need to transfer the pupa to the top platform of the butterfly cage and you need to do it in this fashion: Carefully remove the lid. And under the lid you'll find a piece of paper. The pupa are attached to the paper. Now what I need to do is put this down and take out two pieces of tape, one on each side. And then carefully attach this to the top of the cage. I'm going to add one more piece of tape right there. I think maybe even another one on this side just so it's secure.

Students may observe them wiggling on their own, not from the table shaking. And the last thing that you do is to pull up the net so that the elastic comes up on top of the plastic. Now all you have to do is wait.

<Investigation 5, Part 3>

Narrator: Part 3 begins as soon as a week later when the adult butterflies begin to emerge. The students will see a red splat or several of them on the bottom liner of the cage. And they may be alarmed. They may think it's blood. But it's not. Tell them that's the waste product that was in the cocoon and emerged as the adult butterfly emerged.

This is when you need to tell the students that the adults need nectar. We're going to provide that in the vial. We have sugar water in here. And that will provide their nectar. And we're also going to provide a substrate, some leaves, mallow leaves, for the adults to lay their eggs on. So we'll put those in the cage right now.

Now, this cage can go almost anywhere in the room where the students can observe it. But it seems -- or the butterflies seem to prefer sunlight. So if you can put it somewhere near the window where it will get some sunlight in the afternoon, that seems to be better to the butterflies.

The students may observe mating. And if you're lucky, they'll see eggs deposited on the mallow leaves. In a week or two, those eggs will hatch and tiny little black Painted Lady larva will emerge. They will graciously eat the mallow and the students may see some silk and some droppings in the mallow plant. If you're courageous and want to go through it again, you can allow those larva to go through their life cycle as the first larva did.

That brings us to the end of Activity No. 5. Here are the concepts that students have been introduced to in Investigation 5: Insect larvae and adults have structures in common; the life cycle of the butterfly is egg, larva, pupa and adult which produces eggs.

<Investigation 6, Part 1>

Narrator: The last activity, Activity 6, is called Other Insects. We didn't want to leave any insect

out of this module. We wanted you to feel free to include your favorite insect or perhaps an insect that a student in your class might be interested in. There are a few more that are good that we suggest that you bring to your class.

Let's take a look at what some of those are. One of them is a cricket. Crickets are great to keep in the classroom. You can build a cricket habitat and students can watch over time and with luck you might be able to see them go through their life cycle.

Other insects that we suggest are ants. Bringing an ant farm is great. And aquatic insects can be very interesting. But you need to have a place to secure those insects. So consider what is good in your locality and think about including some of these insects in the module.

Let's take a look at the materials that you'll need for working with crickets. We've included some in the kit. We have in the kit this container, clear plastic. It's got holes cut on the two sides. And it comes with a lid. And then we have two lids that are also cut open a couple of washers, some rubber bands, some seeds, cricket food, a vial that you'll use to make a fountain just like we did with the milkweed bugs, some netting, sand, some soil and a tool that you need to make the fountain, the hole punch.

The things that you'll need to provide for crickets include a pair of two liter soda bottles, an egg carton, a pair of scissors, paper towel and some tape. Duct tape will work just fine. Let's see how to assemble a cricket habitat. You'll want to do this with all of your class participating.

You'll need to get this container with the two holes in it and bring your soda bottles. You'll want to cut a long oval, on one side of each of the soda bottles. You can use scissors to do that. You'll also want to find in the kit the lids and the washers because you're going to attach the bottles to this plastic container with those. Let me show you how to do that.

You need small hands for this. I'm going to put the rubber washer over the bottle opening making sure that I get it flat all the way on, pushed on tight. And then you're going to take the screw cap and you're going to put the screw cap inside the container, screw it onto the bottle nice and tight.

Now that we've got one side done, I have to do the same thing on the other side. Make sure that I've got this washer on all the way. Because we don't want the crickets to get out. Okay. Now, I've oriented those ovals so the ovals are on the top facing up.

Now I'm going to get the sand. And with this opening here, I'm going to pour the sand into this container so that it's almost up to the neck of the bottle. And over on this side, I'm going to take the soil and I'm going to fill this bottle again almost up to the neck of the bottom with soil.

We want the soil side to stay damp. This is where we're going to plant the seeds, the cricket food seeds, have some greens for the crickets to eat. We want the sand side to remain dry all the time. Crickets generally like it hot and dry. But they need wet soil in order to lay their eggs. So that's why we're setting up two different environments, one wet for the possibility of egg laying and one dry for most of the time. And on the dry side that's where we're going to put food for the crickets.

Now, the center container, the living room, we're going to put the water fountain. So make a water fountain just like we did in the milkweed bugs. And put the water fountain in there. This is also where you're going to put some climbing structures. And you can cut up an egg carton and put it in here so that the crickets have something to climb on.

The last thing that's very important is that we need to cover all three of the openings so that the crickets can't get out. If there's a small space, they will get out. We're going to use some metal wire, some screen. And I've got it. And I've molded it so it will fit over this opening. And I'm using duct tape to secure it to the bottle.

But from time to time since this is on the dry side, I'm going to want to open this up in order to get in here and put some food. So that's what the duct tape is for. It will allow us to open it up. See, I've got a little buckle there. You want to make sure when you secure it down, there's no way for the crickets to get out. We'll also put a screen over here on the soil side. There's a lid in the kit for the cricket habitat or you can use window screen to cover the top.

Teacher: We'll take that off. There's that cloth and here is this heavy cloth. We'll set that down there. And then we'll put the crickets in.

Student: Do you want me to sit here?

Teacher: The bag is open. The bag is in here.

Student: Yeah, they are going in.

Teacher: Are they all in?

Student: No.

Teacher: Are they all in?

Class: Yeah.

Narrator: We put sand on one side and keep it dry because crickets like it hot and dry generally but we put moist soil on the other side just in case we can have them lay their eggs. They need moist soil in order to lay their eggs. So we want to provide both environments, dry side on one, moisture on the other. And on the dry side is also where you'll feed the crickets dry food. Sometimes you can put in apples or oranges. In the center area, the living room, that's where we'll provide the water, the drinking fountain. And you'll make that in the same way as we made it for the milkweed bugs.

<Investigation 6, Parts 2 and 3>

Narrator: Crickets are very easy to maintain in the classroom. Another insect that's very easy to maintain are ants. And we suggest that you purchase and bring into your classroom an ant farm. One like this. Now, when you buy the ant farm, the ants aren't in there. You have to mail away for them separately.

When they come, you dump them in according to the instructions. And for about two weeks the

students will be able to see the worker ants build all their chambers. You won't be able to see life cycle because there is no queen in with the ants that you get. Only workers. So after a short period of time, a couple of weeks, they will all die. But it will be very interesting for the students to watch, nevertheless.

Speaking of death, we need to deal with that in this module because the students will observe lots of insects go through their life cycle and die. And some will even die prematurely. We suggest that you bring into class this book called "Lifetimes," a beautiful way to explain death to children. It focuses on the life times of many organisms, humans and insects and others. So this is one that's recommended. You can get the information in the fact sheet in the Teacher Guide.

We've looked at 6 of the 20 million insects that we have on our planet. Now, you don't have to bring all of these insects into your classroom. But we encourage you to do as many as you can. Do those that are appropriate to your geography, to your space and to your time. They will bring lots of excitement and lots of life into your classroom. Here is the main concept that students can be introduced to through Investigation 6: Insects can live underground, above ground and in water.