

FOSS® STRUCTURES OF LIFE 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 found that they work extremely well in the hands of all teachers and are effective for youngsters in learning about science.

<Larry Lowery Introduction to Module>

This module introduces students to the four biological processes that define all of life. All living things grow. All living things respond to aspects in their environment for survival. All living things reproduce their own kind. And all living things take in raw material as food and give off byproducts. In this module students study the growth and life cycle of one type of plant, the bean. They study it throughout all of the stages of its life cycle. Given time, the plant, flower and new seeds develop. This can be harvested and planted and the process can be seen again.

The characteristics that define life of plants hold true also for animals. In this investigation students study snails and crayfish. The structures of these animals are studied in the relationship to how the animal survives in its environment.

<Linda De Lucchi Introduction to Module>

Narrator/Linda De Lucchi: Hi. I'm Linda De Lucchi from the Lawrence Hall of Science here to get you started with the FOSS Structures of Life module. The module consists of four investigations designed to give students firsthand experience with a variety of organisms. They observe living plants. They describe and compare their structures and learn about their life cycle. They observe, describe and compare the structures and behaviors of a variety of organisms they maintain in the classroom.

As a result of caring for these organisms over time, the students begin to understand how the

structures function in the growth and survival of the organisms. This module introduces students to the diversity of life and helps them start to develop a respect for all living things.

Most of the equipment that you'll need to teach this module comes in the kit. These materials that you see here on the table come in two boxes. These two large bus trays come in a separate shipper box. The equipment kit comes with enough equipment for a class of 32 students. Be sure to check the inventory list and the Materials folio to find out which materials are consumable and which are permanent.

From the measurement kit you'll need the balances and cups, the one gram pieces, the hand lenses, the pitcher and the eight basins. These are the materials you'll need to provide: Paper towels and paper plates, water and bleach, white glue, transparent tape and some thread or string. You'll need to get a collection of fruit, six or seven pieces for each group, a water plant called elodea, some land snails and crayfish.

The Materials folio provides details on how to obtain the living organisms. Your school may have purchased the living organisms coupons when the kit was ordered. If so, complete the information requested on the coupons and send them to Delta to order the organisms or you can order them from a biological supply company or local pet shop or aquarium. Pet shops can sometimes special order crayfish or land snails for you. Crayfish can be ordered from bait shops and even some restaurants in some parts of the country. Your students may be able to fish them out of local creeks and streams. And land snails may be available in your garden.

Before you begin teaching, it's important to look through the entire Teacher's Guide. First you'll find the Overview folio, which points out the national standards addressed in this module as well as information about how to make best use of the Teacher Guide. It also includes valuable background information specially written for teachers who have not had extensive science training.

The suggested teaching schedule on Page 16 of the Overview will be particularly helpful as you plan for the growth and survival of the plants and animals studied in this module. Next you'll find the Materials folio. If you're the first teacher using a new kit, you'll want to turn to the section that describes first time prep. If the kit has been used before, check the section with directions for each classroom use. Both of these sections will give you helpful hints that will save you lots of prep time later. And check the folio for information on obtaining those living organisms.

The next portfolios are the investigation folios. These are the heart of the program. Each takes one or two weeks to complete. The first page provides overview information. The At A Glance chart summarizes the investigations and helps you plan for assessment and extension activities. Next you'll find background information specific to this investigation and a section called Teaching Children About which gives you some insight into research about how children think and learn.

Then for each part of the investigation, you find a materials list, Getting Ready section and step-by-step instructions for how to proceed through the investigation. At the end of the folio, you'll find Interdisciplinary Extensions. You can do some of these extensions with the class or save them for students to use as projects at the end of the module.

Next come the investigation duplication masters. Each master is labeled with a number so it will be easy to find when you need it. Shortly before beginning this module, duplicate the letters to parents and send it home with the students. This letter tells parents about the module and suggests some activities that they can do at home together.

It's important to read the Assessment folio before you begin teaching. It describes a system for assessing students throughout the investigations and also gives you ideas for end-of-the module testing and portfolio assembly. The folio contains scoring guides for each of the assessments suggested.

Next come the assessment duplication masters. Here you'll find all of the masters for the assessment charts and the end-of-the-module assessments. The Science Stories folio provides background information and recommends when to read the stories and do the follow-up activities. You may want to read the Science Stories during a reading period rather than during science time, especially if you only teach science a few times a week.

In the Resource folio, you'll find lists of trade books, videos, computer software and other resources that you can use to enrich the program. And finally comes the FOSS website folio. On the website you'll find simulations for each module in the program. Students can contact scientists and FOSS students across the country. You'll need to check the website to see the many features available there, including the resource for teachers.

<Investigation 1, Part 1>

Narrator: To start their seed investigation, students go on a seed hunt. They open up a variety of fruit, locate the seeds, describe the properties of the seeds and then count or estimate the numbers. For each activity throughout the module, you'll want to set up a materials station. Here is what you'll need for this part of the investigation: From the kit the only thing that you'll need are the plastic knives. You'll need to provide paper plates, one for each group, and you'll need to provide about 40 large or mature beans.

These are string bean pods. Another option is to get fava bean pods. The seeds are really big. The pods are easy to open. They will be interesting for the students.

Then you'll need to provide a collection of fruits, six or seven for each group. They don't have to be the same. You might be able to get these free from a produce market. Slightly damaged fruit won't sell but it will be perfect for this activity.

The last thing you need to provide are paper towels. Duplicate Student Sheet No. 1 called Comparing Seeds and make a copy of the Assessment Chart For Investigation 1. Prepare two charts, a Word Bank chart and a Content/Inquiry chart using large sheets of paper or a flip chart. Have them ready for the wrap-up session for the first part.

Make a Project Folder for the class. As students think of project ideas throughout the investigations, have them write them down on a piece of paper and put them in this folder. They can then select those ideas at the end of the module.

When thinking about how to have the students open the fruit, you might encourage them to cut

the fruit on the equator and that way they will be better able to see the interesting patterns of the seeds inside. You will want to avoid fruit like hot peppers that might cause a problem or messy fruit such as eggplant. And remember when you're selecting fruit that some fruit such as these seedless grapes won't have any seeds inside. It's fine to use those. Kids might find it interesting. But be sure to think about it before you select the fruit. And finally, you want to make sure that the students understand the rules that you expect them to follow. If you don't want them to eat the fruit during the investigation, make sure that's clear.

To begin the activity, the teacher asks the students to describe the properties of a familiar fruit.

Teacher: What are the properties of this object?

Caitlin?

Student: It's green.

Teacher: Okay.

Student: It's round.

Teacher: Round. Somebody else?

Student: Inside of it it's sort of whitish.

Teacher: Okay.

Student: And juicy.

Teacher: Inside white and juicy. All right. What other properties describe this?

Elise?

Student: It's hard.

Teacher: Hard. So we've described color, shape, a little bit of texture and substance with this.

Narrator: The getters get two pods for their groups so the students can examine the bean pods. The students feel the texture, look closely and even smell the bean pods.

Teacher: Now I'm going to give each pair one knife. And you're going to be able to open up your object and look inside. We're going to take a look inside. I just want you to see what's inside right now. Please remember, we're not eating these. We're just looking at them. Okay? Getters come up and get two knives for your table.

Student: You cut half.

Narrator: Some students will make a cross cut and try to look inside the pod. It may take them a little longer to get to the seeds inside. But that's fine. Let them discover that on their own.

Student: Oh, there's a seed.

Student: Well, actually you know what? It's easy to cut with your like fingernail.

Narrator: Some students will cut the pod the long way and will be able to count the seeds right away.

Student: Whoa.

Student: Oh, my gosh.

Student: Look how many seeds are in this one.

Student: One, two, three, four --

Student: Five.

Student: There's one, two, three --

Student: There's like a little capsule or something where the seeds are. See, that's where the seeds are supposed to be.

Student: There's eight seeds in this.

Narrator: After the students have located and identified the seeds, the teacher explains they have just opened a fruit and found what is in all fruits: Seeds.

Teacher: So the part of the plant that holds the seed is called the fruit.

Narrator: Your students may claim that a bean is a vegetable, not a fruit. Explain to them that in everyday language we call beans and peas, squash, cucumbers, we call these vegetables. But in scientific terms, they are actually fruit. Next have the students describe the properties of the seeds and then count the number of seeds they find inside.

Teacher: Looking at this histogram, what would you predict -- if we had another bean and we were going to open it, what would you predict would be the number of seeds inside?
Soloff?

Student: About three or two or something.

Teacher: Three or two? What would you be basing that on?

Student: Well -- well, there aren't many of them. But because two doesn't have any. Because you might get some beans that don't have any of them or something.

Teacher: All right. Anybody have another idea?
Caitlin?

Student: I think there would be four or five. Because that's -- in the majority of the beans there

were four or five.

Teacher: Okay. The probability would be four or five because we had the most here. Okay. Good. Thank you. Now you're going to look at this chart on the paper. It has the name of the fruit, the number of seeds, properties of the seeds and a drawing or a sample of the seeds.

Student: Number of seeds. 9.

Student: Properties of seeds.

Student: Kind of hard.

Student: Well, a little soft because when we squeeze it, it's very soft.

Narrator: The students will now have a variety of fruits to work with. They will work in teams to open the fruits, find the seeds and record their observations. If a fruit contains too many seeds to actually count, the students have a problem to solve.

Student: Well, I guess all of the seeds are in here. Like the green bean like in pockets, it's -- and like I think that there's maybe about seven in each pocket probably.

Teacher: How are you going to go about that estimation? Do you have a strategy?

Student: No.

Student: I have an idea.

Teacher: You have an idea?

Student: Yeah.

Teacher: What's your idea?

Student: You count the first row. And then the first row and say all of the other rows have the same many and then do it again.

Teacher: Okay. Do you think you can do that, Madison? Count one row?

Student: Yeah.

Teacher: Okay. Good.

Student: This one has -- that's pretty hard to count all of the seeds.

Student: Yeah.

Student: Well, that's like one huge one.

Student: I can't believe this has 96 seeds.

Student: It's hard to get through the middle.

Student: Whoa.

Student: Wow.

Student: See, look. It's like a tomato. See, they are hanging on.

Narrator: The students continue this investigation by sorting the seeds by their properties. Each reporter explains how the group sorted the seeds. Then all of the seeds are saved for the extension activities.

Teacher: And for our Word Bank I would like you to think about --

Narrator: Before ending this session, the teacher begins the Word Bank and the Content/Inquiry chart.

Teacher: What do we want to put on our list?

Student: Seeds.

Teacher: If we couldn't count all of the seeds, how would we figure out --?

Student: Estimate.

Teacher: Good. We want to use the word estimate. Any others?
Lizzy?

Student: Properties.

Teacher: Properties. Good.

Narrator: The most important thing for the students to take away from this part is that seeds come in a variety of forms. But they have one thing in common: They all come from fruit. And the fruit is a part of the plant. There are a number of readings in the Foss Science Stories dealing with seeds and fruit. Be sure to take a look at the Science Stories folio so you'll know when is the best time to have the students read these stories.

<Investigation 1, Part 2>

Narrator: In Part 2 of the seed investigation, the students use two different sprouting devices to find out what effect water has on seeds. They water the seeds on a daily basis for a week and observe and record the changes. Here is what you'll need for this part of the investigation: From the kit you'll need the glass sprouter, the five milliliter spoon, the brush to clean out the sprouter. You'll need the quarter liter containers and the lids and the coffee filters. Together these three become the mini sprouters. You need four kinds of seeds: Beans, peas, sunflower and popcorn. And you'll need cups to distribute the seeds.

From the measurement kit you'll need the pitcher. That's for the water. You'll need to provide white glue, bleach and transparent tape. The students don't use the bleach. You do. You add five milliliters of bleach to the pitcher of water to prepare the water for the seeds. That helps to keep down on the mold.

You'll need to make copies of three different sheets. The first sheet you'll need is No. 3 called Sprouting Seed Placemat. You'll also need copies of No. 4, The Sprouting Seed, and No. 5, Response Sheet - Origin Of Seeds. Also have the Assessment Chart For Investigation 1 available.

To begin this lesson, the teacher reintroduces the term "property" meaning size, shape, color and texture. Now the students will have four different kinds of seeds to investigate and describe.

Student: Popcorn.

Student: Pea.

Narrator: Each student selects one of the seeds to examine carefully.

Student: Is this a sunflower seed?

Student: Yeah.

Student: Oh.

Student: They look like dried out peas.

Student: This is a dried out pea.

Student: No. This looks like a dried pea.

Student: No. This is green.

Student: No. This is green.

Student: No. Look. I'll make one piece of popcorn.

Narrator: The students record their observations on The Sprouting Seed Student Sheet. Then they draw a picture of their seed. After the students share their observations, ask them what they would need to do to grow the seeds and how they can find out if the seeds would grow in just water without any soil. After a brief discussion, bring out the mini sprouters and introduce them to the students.

Teacher: Everybody will get a coffee filter, a plastic container, which later we will name our mini sprouter. And you will take -- put the coffee filter in, take all your seeds and pour them in. I'm going to come around with some water. And this is really important that you know that I'm going to add a little bit of bleach to the water to kill mold that might grow in our seeds if we

didn't add the bleach. This water has bleach in it. You don't want to get it on your skin or on your clothes. It might smell a little bit.

Student: Ewww.

Teacher: It smells like bleach. Do you all have your seeds?

Student: Yeah.

Teacher: What we're going to do is we're going to leave it on the middle of the table covered. We're not going to play with it. We're not going to touch it or anything. We're just going to leave it until the next part. Okay. The getter will come here, get a sheet. Everybody writes their name.

Student: How do you spell your name, David?

Student: D-a-v-i-d.

Teacher: Then the getter comes back, drops of glue, walks to their seat.

Student: Whoa.

Teacher: The seeds go on the sheet and the sheet stays at your seat.

Narrator: Here is how the students save one of each seed to later compare to the seeds in the water.

Teacher: You're going to hold your mini sprouter in both of your hands and walk very carefully to the sink. But I'm going to show you in this tub what you're going to do. You're going to hold this and you're going to take the lid. And the lid is going to come off just a little bit. And you're going to drain the water out. You don't want any seeds to fall out and you don't want your coffee filter to fall out. But you want to get out as much water as possible.

Once that is drained -- once it's drained, you make sure the lid is snapped on tight because we want these seeds to stay wet overnight. Okay? We don't want a lot of air to get in there to dry them out. You do that. Then you walk back to your table and put it on your sprouting mat. Hold it like this and drain. There you go. Slowly. There you go. You got it.

Narrator: After they drain the water, the students secure the lids on the sprouter and store them in a safe place along with a placemat. Now is the time to bring out the class sprouter and the seeds that you prepared ahead of time. Show the students that the sprouter has several parts. The bottom tray is actually a bowl where the water will collect. Then there are three trays on top. Each tray has some groves on the bottom and has a red cap covering a tube. Together the tube and red cap form a siphon so that the water can travel from one tray down to the next.

To set up the sprouter we're going to put bean seeds on two of the trays and we're going to put a combination of sunflower, pea and corn on the bottom. We'll stack them back up. Bring out the dilute bleach water and pour a half liter of water into the top tray. It will take a few minutes for

it to siphon on down to the bottom.

When the water collects on the bottom bowl, you're going to toss that out. We don't reuse that water.

The sprouters -- the class sprouter and the mini sprouters should be watered every day. After the sprouter is set up, have the students help you label each tray. Wrap a dry seed in a piece of tape and stick it right there to the tray.

You'll notice on this setup the red caps covering the siphons are not on top of each other. They are set slightly ajar. That's the way you'll want to do it when you set it up.

The students should observe and describe all of the changes that they see each day. If any of the seeds start to mold, you should toss those seeds out. That's important.

If you begin this activity on the Monday morning, you can expect to see this kind of growth by Friday afternoon. The seeds in the class sprouter and the mini sprouter should be fine over the weekend. You can then continue the investigation first thing Monday morning.

Here are some seeds in the mini sprouters. These seeds are two days old. These seeds are five days old. Have students complete Student Sheet No. 5 called Response Sheet - Origin Of Seeds. You can use this sheet to assess students' progress.

As students observe the seeds in the sprouters over the next seven to eight days, they will see that water can make seeds get bigger, heavier and continue to grow. Work with the students to add ideas to the Word Bank and Content/Inquiry charts. Reinforce that a seed is a living thing, an organism.

Now is the time to introduce the Project Folder. Explain to the students that at the end of the module, they'll select a project in which they are interested in learning more. At this time have them write down questions and ideas and add them to the folder.

<Investigation 1, Part 3>

Narrator: In Part 3, the students compare the mass of dry seeds to the mass of wet seeds that have been soaked in water overnight. They try to determine how much water the seeds have soaked up. For this part, these are the materials that you will need: From the kit you need plastic cups and large lima beans. From the measurement kit you'll need eight balances with cups. You'll need eight additional cups, each containing 15 one gram pieces. You'll need the hand lenses and the pitcher.

Remember, before the students use a balance, they will need to zero it by moving the slider to one side or the other on the beam. You'll need to make a copy of the Student Sheet No. 4 called The Soaked Seed. Also have Assessment Chart For Investigation 1 available.

Now we're ready to start. The students have been observing changes in the seeds in the mini sprouters. Have them share some of those observations. Introduce the idea that an important part of science is making observations and then asking questions about those observations and then trying to set up investigations to answer those questions.

For example, the students have observed that the seeds have soaked up water. How could they

find out how much water the seeds soak up? Have them share their ideas and work towards the concept that they would have to weigh the dry seeds, let the seeds soak up water and then weigh the seeds again to make that determination.

To get the investigation started, the teacher brings out the balance and cups, the gram pieces and the dry lima bean seeds. She distributes the student sheet called The Soaked Seed and the students start by tracing the dry seed. They weigh the dry seeds and record the mass.

Student: There's more than this side.

Student: Take one out.

Narrator: The getters pour water into the cups so the beans are just covered. The groups label the cups and store them overnight. The next day the students examine the seeds and discuss the changes. The students carefully weigh the beans and find they weigh quite a bit more. They calculate how much water the seed absorbed.

Student: Three.

Student: No, four.

Student: Four.

Narrator: The seed coat will easily slip off and students will be able to open the two halves of the seed and look inside.

Student: It comes right out of it.

Student: Uh-huh.

Student: Elise, look. It comes right out.

Student: Cool.

Narrator: They should find the tiny embryo at one end of the seed.

Student: This is really -- it's kind of like a pea.

Narrator: Have the students add new words to the Word Bank. This part reinforces the idea that the seed soaks up water and that it causes the plant to start to grow. The students will have observed the tiny embryo inside the seed. Before leaving this part, select from the interdisciplinary activities and have the students do the math problem of the week.

<Investigation 2, Part 1>

Narrator: In this part, the students compare the germinated seeds from the mini sprouters. They identify and describe the emerging plant structures such as stem, roots and leaves. Here is what you'll need for this part of the investigation: You'll need the class sprouter with germinated seeds and the eight mini sprouters.

From the measurement kit you'll need the hand lenses and you need to provide paper towels. You'll need to make copies of the Student Sheet No. 7 called Comparing Germinated Seeds. Since students don't write on this sheet, you may want to laminate it so it becomes permanent equipment. Also make a copy of the Assessment Chart For Investigation 2.

Plan this session seven to ten days after starting the seeds in the sprouters. The seeds should be germinated with the roots and stems emerging. Each group needs four well developed bean seedlings. Students will use the bean seedlings from their mini sprouters but you can also distribute seedlings from the class sprouter to groups that need them. Be sure to save 25 to 30 healthy bean seedlings from the class sprouter for the hydroponics activity in the next part.

Student: Put them right there.

Student: Let's see.

Student: Okay. What's the first one? Hold on.

Student: The first one is swollen.

Student: It looks swollen.

Student: This one looks like it has the seed on it.

Student: No. The bean that's swollen.

Student: Yeah, that one.

Student: Yeah, that one.

Student: Now what are we supposed to do?

Student: Seed with the coat off. That looks like it has the coat off.

Student: Yeah, it does.

Student: Okay. The root.

Narrator: The students need to spend some time examining their sprouts before being able to recognize all of the parts. Many students make mistakes at first but then they do figure it out.

Student: Oh, no. This is stem and leaves.

Student: No. Wait. I'm putting it on bean.

Student: Yeah. These are all beans.

Student: Let's see.

Student: Here is the root.

Student: Now here's the peas.

Student: This is leaves and root.

Student: Where would this one go?

Student: This is corn.

Student: This is root.

Student: Here's the sunflowers.

Student: Here is the corn without the skin.

Student: No. That's the stem and leaves. Here is one without skin.

Narrator: Let's take a closer look at the student sheet called Comparing Germinated Seeds. The headings up here -- Swollen, Seed Coat Off, Root, Stem and Leaves -- those are properties of a germinated seed that the students will observe. To use this sheet, they look at the sprouted seeds and find one that exhibits each of those properties.

For example, here is a seed that's swollen. Here is one where the seed coat has come off. Here is one with a very good root. And here is one where I can see the stem and leaves. After doing that for the bean plants, the students do it for pea, sunflower and popcorn.

Have students suggest words for the Word Bank. The most important idea that students should get from this activity is that germination is the onset of a seed's growth. And they will also see that seedlings have cotyledons, roots and stems. Be sure to check the Science Stories folio for reading activities to do during this investigation.

<Investigation 2, Part 2>

Narrator: In this part, the students place the bean seedlings in a hydroponic container and observe the seedlings throughout their life cycle. Here is what you'll need for this part of the investigation: From the kit you need straws, two milliliter spoon and the nutrient powder. You'll need two six liter containers. And for each container, you'll need two plant holders.

From the measurement kit you'll need the pitcher and you need to provide the paper towels. You'll need to make a copy of Student Sheet No. 8 called Response Sheet - Growing Further. Use this sheet to take a closer look at students' understanding of the needs of growing plants. Also have available the Assessment Chart For Investigation No. 2.

To begin Part 2, introduce that the hydroponics container and holders will allow the students to grow the plants further in water with no soil. The holder will provide the support for the growing plant. Water alone is not enough to grow healthy plants so nutrients -- two milliliters of nutrient powder will be added to each six liter hydroponic container. After adding the nutrient

powder, the students can stir it with a straw until the powder is dissolved.

Students slip the seedlings into the holes in the plant holders being very gentle so as not to break the seedlings. Be sure to have some extras on hand because some seedlings will break.

Have students suggest new words for the Word Bank. And don't forget to encourage them to be writing down their ideas for projects and putting them in the Project Folder. You can assess students' understanding by having them complete the response sheet, Growing Further. At this point the class has set up an investigation to find out what will happen as the bean plants continue to grow in water with nutrients added. In the next part, the class will set up a system for recording observations each week.

<Investigation 2, Part 3>

Narrator: In this part, the students are introduced to the Plant Growth Chart. This comes just right after Part 2. But then you have to wait six to seven weeks later after the students have seen the beans go through their life cycle. At this point the students put pictures of the stages in the appropriate sequence.

Here is what you'll need for this part: You'll need the hydroponic setup. And from the kit you'll need the straws, the sticky notes, nutrient powder and spoon and meter tape. From the measurement kit you'll need the hand lenses and the pitcher. Here is what you'll need to provide: White glue, transparent tape, two pieces of string, unlined white paper, scissors and paper towels.

You'll need to duplicate Student Sheet No. 9 called Bean Life Cycle and Student Sheet No. 10 called Plant Growth Chart. Also have the Assessment Chart For Investigation 2 available.

Student groups will record measurements of two plants, one in each of the hydroponic containers and record the growth on bar graphs continuing this process for eight weeks or until the plants reach maturity. Make six copies of this sheet called Plant Growth Chart. Cut four of the sheets along the zero centimeter line. Then assemble three of the sheets, one complete sheet and two of the cut sheets. Tape them together. Label the lines 0 centimeters, 10, 20, 30, 40, 50 and 60.

Assign one group to care for the plants each week. Along with adding water and adding the straws to hold up the plants, the group will measure the length of one specific plant in each container. The location of the plant can be marked with a sticky note.

Using either the meter tape or a string, the group will measure the height of the two plants and record that height on the appropriate Plant Growth Chart. Remind the students that the plants must be treated gently to avoid breaking them. Seven to eight weeks later when the bean pods are about seven centimeters long, let the students harvest one or two and open them up to find the seeds inside. This is the perfect time to introduce the plant life cycle.

Now that the students have observed the bean life cycle firsthand, they can work with the student sheet Bean Life Cycle. These students are describing and sequencing the stages of the cycle. Your students may get into an interesting discussion of which came first.

Student: I have a question for you: Which came first, the plant or the seed?

Teacher: That's a good question, isn't it? What do you think?

Student: I think the seed.

Student: The plant.

Teacher: You think that the plant --

Student: You should start --

Teacher: Did the plant float down from space?

Student: No. But the seed came from the plant. I don't know.

Teacher: Where did the plant come from?

Narrator: Have your students add new words to the Word Bank. The important thing for your students to learn in this part is that fruits develop from flowers. Your students will begin to develop an understanding that all organisms go through repeating stages that we call a life cycle. Before leaving this part, select from the interdisciplinary activities and be sure to have your students do the math problem of the week.

<Investigation 3, Part 1>

Narrator: In this investigation, your students get firsthand experience with the crayfish. Here is what you'll need for Part 1: From the kit you'll need the plastic spoons and the quarter liter containers. From the separate shipper box you'll need the two large bus trays. From the measurement kit you'll need the pitcher and the eight basins.

You'll need to provide a dozen crayfish and 12 sprigs of elodea. If you order them from a biological supply house, they'll arrive in a box something like this. The air holes will be a dead giveaway and the school secretary will notify you immediately.

They will come in wet newspaper. Transfer them immediately to a basin with cold tap water, aged tap water. And you can put about six of them in one bus tray. Make copies of two duplication masters, Student Sheet No. 11 called Crayfish Structures and Student Sheet No. 12 called Crayfish Diagrams. Also make a copy of the Assessment Chart For Investigation 3.

Practice picking up the crayfish so you can demonstrate it for the students. The way to approach them is from the rear. And you want to grab the carapace not too hard. And that way they can't reach back and you get you.

This is a female that I've just picked up. You can see the long lush swimmerets under the tail. Males don't have long swimmerets. Their's are very tiny. And here is where the female holds the eggs until they hatch.

Don't feed the crayfish in the bus tray habitat. The food will spoil the water. Rather, remove the crayfish to a basin and put in enough water to cover their backs. Then add a few pieces of crayfish chow. Actually it's cat food. Sometimes they will eat and sometimes they don't. Leave

the crayfish in the feeding chamber for a half hour or so.

To get ready for the first session, place one crayfish in each of the eight basins with enough water to cover the crayfish back. Bring out the plastic spoons and quarter liter containers in case the students are reluctant to pick the crayfish up with their hands.

Teacher: This morning we're going to look at a special living organism called a crayfish. Each table is going to get a crayfish to look at with their eyes only. And there's some special things you're going to need to remember about these crayfish. We are going to treat them with care and respect. Can you tell me what that means? How would that look and sound?
Daniel?

Student: Being nice to them.

Teacher: How could you be nice to these crayfish if we're just going to look with our eyes?

Student: Don't touch them.

Teacher: You're going to not touch them. Good. Myrna?

Student: Don't make loud noises.

Teacher: Good. You're just going to observe them. Look at everything you can about the crayfish when they are at your tables. Okay?

Student: That one is long.

Student: It's almost like a lobster.

Student: It has little claws to get all of the meat out.

Student: Let's put him in your sleeve.

Student: Gross, Daniel.

Student: Probably he's hiding his pinchers, one of his pinchers.

Teacher: The next step in this lesson is to actually learn -- yes, you actually get to hold them. But in order to -- if you want. You don't have to hold them if you don't want. And I'm going to give you the way to hold them and a way to just look at them using a spoon.

The first way is to hold them. You want to approach them from behind. You don't want to go in front of them where their pinchers can get you. You want to go from behind. And you want to grab them on the body, which is also called the carapace. You hold them here. You don't want to keep it out of the water for a long time. You want to take a look, turn them over, look at the underneath, look at the top and gently -- you don't want to grab them too tight. You want to be very gentle and put them back very carefully in the water.

And some people are going to say "I don't want to touch them." And that's okay. And that's where a spoon is handy. You want to be gentle with the spoon. The spoon is an extension of your hand. You can take the spoon and move them around. If you want to gently flip it over so you can look at the underneath of their bodies, you can do that. You can see if he can grasp the spoon with his pinchers.

Student: Aren't you hurting him?

Teacher: No, if you are very gentle. The key is be very gentle with this creature. And using the sheet, you're going to get a more close-up look at them. You can handle them very carefully holding them up. You can use the spoon to turn them over to look to answer these questions on a crayfish structure sheet.

On the sheet you're going to put your name and very importantly today's date. And then it's going to ask you questions. No. 1: Do crayfish have eyes? And you need to look very carefully at your crayfish using the spoon or with your hands. Count the eyes. How many? It asks you how many. Do crayfish have ears? You can look. You can answer. If you don't know, you can put a question mark or you can say "I don't know."

So you'll be getting this sheet. And this is going to give you a more -- more of an opportunity to look more closely at your crayfish. Okay?

Student: Turn him over.

Student: Ewww.

Student: Nasty.

Student: They have 8.

Student: They do have eight stickers. I know.

Student: Uh, is this a boy or a girl?

Student: That's what I'm trying to find out.

Student: I don't know about that. I think it's a girl.

Teacher: Keep him close to the water when you lift him up. In case he falls, he only has a little ways to go. There he goes. Okay. What's the next question on your list? Do crayfish have ears?

Student: Yeah.

Teacher: How can you tell?

Student: Because they can hear us scream.

Teacher: Because they can hear noise? Can you locate their ears? Can you see any structure that looks like an ear?

Student: There.

Teacher: Where? Point with the spoon.

Student: Right there.

Teacher: You think? So are we sure? Are we absolutely positive they have ears or we're not sure?

Student: We're not sure.

Teacher: We're not sure so we can say not sure.

Narrator: When most of the students have completed their student sheets, call the class together to share their observations.

Teacher: So we've discovered our crayfish have two antennae. How many tail flaps do our crayfish have?

Alexis?

Student: Five.

Teacher: Five. All right. Do crayfish have mouth parts? All right. Jennifer?

Student: Yes.

Teacher: Yes. Okay. And how about bristles, that hair like structure; do they have that? David?

Student: Yes.

Teacher: Yes?

Student: Yes.

Teacher: Okay. Well, animals that have structures like these are called --

Student: Crustaceans.

Teacher: They are called crustaceans. Good Jerame. Yes.

Narrator: After observing the crayfish, your students will have lots of new words to start off the crayfish Word Bank. The important thing for students to do in this part is to carefully observe and describe a number of the crayfish structures. Be sure to check the Science Stories folio for

the reading activities that go along with this investigation.

<Investigation 3, Part 2>

Narrator: In this part, the students set up two habitat trays and learn how to care for and feed the crayfish. Here is what you'll need for this part: The two bus trays with the crayfish and the elodea. And from the kit you'll need the two bags of gravel, cat food and the two basins. From the measurement kit you'll need the pitcher. Duplicate Student Sheet No. 13 called Crayfish Log. Also have the Assessment Chart For Investigation 3 available.

Begin this part with a class discussion of crayfish housing needs.

Teacher: We know that the crayfish need food, water. We want to find out where they sleep. But what else do we need to know about crayfish?
Daniel?

Student: Can they live together?

Teacher: Can they live together? All right. And what else do we need to know about crayfish?
Xavier?

Student: Do they need air?

Teacher: Do they need air? The place where our crayfish will live is called their habitat. And we know a lot about habitats already. But in our classroom the fish -- the fish! The crayfish will live in these. This is going to be their in-the-classroom habitat. You're going to need gravel first. Cut the bags. There you go. That's good.

Student: I can't see.

Teacher: That's okay. You're going to see in just a moment. That's enough. It will pour in. And pour and spread it on the bottom of the bus tray. Okay? Good. All right. We're going to add plants. This special plant that crayfish absolutely love is called anacharis. You might have seen it at the fish store. And we need to put a few pieces in. Just take a few pieces. Kelly, can you take a few pieces? And what's the last thing we need to put in before we put the crayfish in?

Student: Water.

Teacher: Let's see? Jerome?

Student: Water.

Teacher: Water. Next we're going to put our little crayfish in here.

Student: Don't you need water?

Teacher: We have water in their -- yeah, we're going to put the water in here. Chelsea, do you want to put that one in here? And Deserae, you're right there -- Chelsea, I'm

going to have you do this one. And Deserae, you can do this one.

Student: What do we do?

Teacher: Remember to go from behind. Gently -- yeah, she's right. And go ahead and pour the water in maybe over here so it's not right on top.

Good, Deserae. You got it. Excellent. Careful. Oh, beautiful. Now pour the water not directly on top of our crayfish. Okay? Right here in this corner will be great. There you go.

Narrator: Once the habitats are ready, the students put all of their crayfish back into the trays.

Teacher: Right. You've got it. I'm so proud of you. Good job.

<Investigation 3, Part 3>

Narrator: In this part, students look more closely at crayfish behavior. Here is what you'll need for this part: You'll need the crayfish in the bus trays. And from the kit you'll need two sets of crayfish houses. From the measurement kit you'll need the eight basins. You'll need to make copies of two student sheets, No. 14 called Crayfish Behavior and No. 15 called Response Sheet - Crayfish. Have the Assessment Chart For Investigation 3 available.

Start this part by introducing the term behavior, what an animal does. Explain to the students that they will have an opportunity to closely observe the crayfish behavior. Using the student sheet as a guide, students observe and record specific crayfish behaviors.

Student: It's going under it.

Student: He's going under it to hide.

Student: He backed up.

Student: Yeah.

Student: I see his legs.

Student: I saw his legs.

Student: He's trying to back up more.

Student: Here it goes. Okay. Put this one in there.

Student: What do we do?

Narrator: Sometimes the children's enthusiasm creates so much commotion that the crayfish don't do anything. After a while, the children settle down and the crayfish become active.

Student: Okay. Here it goes.

Student: Yes.

Student: Now what?

Student: He's not doing anything.

Student: Whoa, they are trying to fight.

Student: On guard; on guard.

Student: Put 'em up.

Student: I can't see.

Student: You're a chicken.

Student: Stop that.

Teacher: What happens when we put two crayfish together?
Chelsea?

Student: First they did completely nothing.

Teacher: Oh, first they did nothing. All right. Yeah?

Student: And then they put their claws up.

Teacher: All right. Is there another name for those claws?

Student: Pinchers.

Teacher: Their pincers up.

Student: Then they wrapped around each other.

Teacher: Okay. Then they wrapped . . .

Narrator: After the getters return the crayfish to the habitats, the students complete the response sheet called Crayfish.

<Investigation 3, Part 4>

Narrator: To continue the crayfish behavior investigation, the students set up a week-long observation and recording system to study the territorial behavior of crayfish. Here is what you'll need for this part: You'll need the crayfish in the bus trays. From the kit you'll need the crayfish houses, the roll of duct tape and yarn and the white dots that the students will use to map the location of the crayfish.

From the measurement kit you will need the pitcher. You'll need to make eight copies of the Student Sheet No. 16 called Crayfish Habitat. Each group gets one of these sheets. Have the

assessment sheet for Investigation 3 available.

If students can't tell the crayfish apart by size or coloration, you'll need to mark them. Yarn is supplied in the kit for this purpose. Dry the carapace off gently but thoroughly and tape a small piece of yarn to the back with duct tape.

To begin this part, introduce the crayfish houses pointing out the geometric shape on each one. Here is the bar house, the round house, the square house and the triangle house. Distribute the Crayfish Habitat sheet, one to each group, and explain that the houses will be placed in the habitat according to the illustrated arrangement. This will help the students observe the behaviors of specific crayfish.

The students move the crayfish and gravel from the trays to the basins and dry out the trays as much as possible. The students tape the houses in the tray according to the diagram on the student sheet and replace the gravel and water. If you don't tape the houses down, they will become mobile homes or houseboats.

Student: Spread it all around.

Student: What does it feel like?

Narrator: After they spread out the gravel, the students begin to bring the crayfish back to the trays. Now they name their crayfish.

Student: This is Fireball.

Student: Yeah, Fireball.

Narrator: The teacher helps tape yarn on crayfish for identification.

Teacher: Now, this guy seems long and tough.

Student: Which one is this?

Student: That one is Sunny.

Narrator: The teacher explains how to observe the different behaviors of different crayfish.

Student: Why does he have that kind of tail?

Teacher: So we can tell him apart from all of the others. You can see this guy because he's long and tough. You can tell this guy because his antenna has been eaten.

Student: Mine is in there.

Student: Don't squish them.

Narrator: Students observe the location of their crayfish.

Student: This one is north.

Narrator: Then they record the data on their student sheet. They will continue this for four more days. Here is an example of a Word Bank that might result from this investigation. With any luck, your students will observe the way in which crayfish set up a territory and defend it from other crayfish.

<Investigation 4, Part 1>

Narrator: In this part, students design a classroom habitat for land snails. Here is what you'll need for this part: From the kit you'll need the two clear plastic basins with lids, cups with lids and the spray mister. You'll need to provide snails, a carrot or spinach, a piece of chalk, unlined paper, some rubber bands and paper towels. You'll want to make a copy of Student Sheet No. 17 called Land Snail Log and make a copy of the Assessment Chart For Investigation 4.

When the snails arrive, line the clear basin with a paper towel and then put the snails in along with some food. I've got carrots in here now but you could put spinach, as well. Then spray the inside of the container to moisten it. Put the lid on the container and secure it with rubber bands so that the snails won't come out.

Just before the activity, place two snails in a cup for each group. If the snails are inactive, spray them with a little water at any time. Make sure the lids are securely in place.

Teacher: Now I would like to talk to you about how we're going to handle these snails. You are each going to have a cup at your table. And you will have two snails inside. And when you remove them from the cup, I want you to be gentle and slide them along the edge of the cup until you remove it. In other words, don't pull it away so hard that you might hurt the snail. We're going to just slide it along the edge of the cup until it's off. Okay? So we're handling them gently.

Narrator: Getters get the cups of snails, hand lenses and four plain pieces of paper.

Student: Ouchy.

Teacher: How many ways are the two snails different? Okay. So you want to look at those type of things.

Student: One is smaller.

Teacher: Look through your hand glasses.

Student: One is lighter colored.

Student: Uh-huh.

Teacher: Try feeling the shell with your eyes closed or feel the snail with your eyes closed. See what happens.

Student: It's rough.

Teacher: How many ways can you see that those snails are different?

Student: Some are big.

Teacher: Look at them. See how they are different.

Student: This is so cool. I thought those were just the antennas.

Student: What about eyes?

Teacher: Carefully look and see what you're observing. Do they have any odor?

Student: What's odor?

Teacher: Odor? Smell.

Student: Why do they have to have shells?

Teacher: I don't know. Why do you think they have to have shells?

Student: I don't know.

Teacher: Good question; good question. Think about the reasons they would have a shell. Think about that.

Student: Protection.

Teacher: Uh-huh. Starters, will you please gently put the land snails back into the cups. Put the lids on them and we're going to discuss your observations. Remember to slide them along the paper right into the cup. Go ahead and put them in there. We need to put the lid on. Remember I asked the question how were they different looking at both snails? I know that some groups were talking about some differences.

Michelle?

Student: One of the snails had a brighter shell than the other.

Teacher: A brighter -- you mean color?

Student: Yeah.

Student: One of the snails has a darker brown than the other snail and one has a lighter brown.

Teacher: Anything different about the structure of the two snails or the structure of the snail that you observed?

Nico?

Student: One was much bigger than the other.

Teacher: Okay. Size. All right. And one more thing.
Brian?

Student: The bigger snail that we had, he wouldn't move. But the smaller one was really active.

Teacher: Okay. Let's talk now about what does the snail need? We talked about that a little bit earlier. These are some of the observations you made. Now let's talk about what does the snail need to live.
Tony?

Student: It needs food and water.

Teacher: What else do they need?

Student: They need soil and leaves and places to climb up.

Teacher: So two things we need for our habitat today is -- here is our terrarium. We're going to add some sandy soil for the snails and some food. All right?

So Chris, will you put the soil in for us? And do you want to press it into the bottom, Chris, for us? Make a nice little home for the snails. And your job is to break up the carrot for him so he has some food to eat. Okay? Okay.

Stephanie you can go ahead and put the food in there now. Okay. Does that look like a pretty good habitat for the snails? Okay. Good job. Thank you.

Narrator: When the snails are safely in their habitat, the students plan for the ongoing care of the snails. The groups are going to take turns cleaning out the container and providing new food. They will also record their observations on the Land Snail Log. Be sure to refer to the Teacher Guide for detailed instructions on how to take care of snails.

Have the students start the Word Bank for the snail investigation and have them contribute ideas to the Content/Inquiry chart. You've now set the stage for the students to start comparing the crayfish and the snails. Be sure to check the Science Stories folio for reading activities to go along with this investigation.

<Investigation 4, Part 2>

Narrator: In Part 2, students compare the structures and behaviors of snails and crayfish. Here is what you'll need for this part: You need the basin with the snails. You need the spray mister. And you'll need eight cups with lids, each cup containing two snails. You'll need to provide a carrot or piece of spinach, chalk, unlined paper and paper towels.

Make copies of student sheet Land Snail Observations, Comparing Structures and the Response Sheet - Land Snails. Also have a copy of Assessment Chart For Investigation 4 available.

Begin this part by distributing a cup of snails to each group along with a land snail observation sheet. Invite the students to go over the structure section on the sheet and record their observations. They can record any other observations they make on the back of the sheet. Then

introduce the Venn diagram.

Teacher: What I want you to be thinking while I'm writing Jerame's name on the Venn diagram is: How are they alike? What things do they share that are the same and how are they different? So let me write -- this is Jerame's side. And in this circle here we'll be writing how he is different from Journey. I'll write Journey here. And in this we'll write how Journey is different from Jerame here and how they are both the same in the middle. Okay? All right. Let me start with Myrna.

Student: They are different because they are boy and girl.

Teacher: Boy and girl. So Jerame is a boy. Journey is a girl. Did I get that right? All right. How are these children the same right now? How can we say that they are the same? Same. Jennifer?

Student: They are both humans.

Student: That's what I was thinking.

Teacher: You're going to fill out the Venn diagram. What's different about crayfish you'll write here. What's different about land snails you're going to write here. And what's the same about the two you will write in the middle. Crayfish have -- what kind of structures do crayfish have? What kind of structures do land snails have? And what kind of structures do they have that's the same?

Student: They both have antennas.

Student: Yeah.

Student: Oh.

Student: Oh, yeah.

Student: No; no. Put it in the middle. What -- whatever they have in common, you put it in the middle.

Teacher: Do land snails have mouths?

Student: Yes.

Student: They eat the heck out of (inaudible).

Student: They have to have a mouth.

Student: Yeah.

Student: They both have mouths.

Teacher: Now what do land snails have that are different from crayfish?

Student: Slime.

Teacher: They have slime. So you want to put slime. Do the crayfish have slime that you can tell so far?

Student: No.

Teacher: Okay. What else? What else do they have that's different.

Student: Shells.

Student: Well, crayfish like water.

Teacher: Well, do they both have shells? So that's the same. What's different? Does it look like this guy has legs like the crayfish have?

Student: No.

Teacher: Legs are different.

Student: What else?

Teacher: Do you remember the stretcher, this part? What's that part called?

Student: The joint.

Teacher: Do they have joints? Do you think the snail has joints?

Student: Pinchers.

Teacher: Does the snail have pinchers?

Student: No.

Teacher: How else are they different? What's this called here? Oh, he didn't like that.

Student: Antenna.

Teacher: Antennas.

Student: The antenna has eyes.

Teacher: Is that a difference?

Student: Crayfish are red.

Teacher: Did you hear what Ben said? They both have antennas. That's the same. But what's different is he thinks the eyes are on the antenna on a snail but not on the crayfish.

Narrator: When the students have finished, have them compare the Venn diagrams. Have them make the connection between structure and function. Here is the Word Bank and Content/Inquiry chart for this part. This is a good time for students to add ideas and questions to the Project Folder.

<Investigation 4, Part 3>

Narrator: In this part, the students conduct an investigation to find out just how strong snails are. Here is what you'll need for this part: You'll need the snails. Put two in a cup for each group as you did before. Also from the kit you'll need duct tape, paper clips and washers.

From the measurement kit you'll need the balances and cups and the mass sets. You need to supply string, thread, white paper and paper towels. Have Assessment Chart For Investigation 4 available.

To get ready for this part, dry off the backs of the snail shell and tape a loop of thread to the back. You'll need to prepare one snail for every pair of students. The students will attach an open paper clip called a sled to the loop.

Begin this lesson by posing this question: Can snails pull their own weight? First the students weigh their snails and paper clips. They should also go on to weigh the snails and paper clips in grams.

Student: That makes it too heavy.

Student: Okay. There.

Student: That's pretty --

Student: That one does it. Three.

Student: Most of them.

Student: That one looks a lot bigger.

Student: That one is a lot bigger.

Student: That's like a rock.

Student: Four.

Student: I think it's four.

Teacher: I want to describe what we're going to do next with the snails. And that is you're going to have a snail race. All right?

Student: Yes!

Teacher: And your snails, they have a little setup on their back so that it's like a sled. They are going to be pulling something. Our question is: How much -- our question is: How much can they pull? Can they pull their own weight?

And so with this sled, what you're going to do is you're going to take from the number of paper clips that you used to weigh your snail, if your snail weighed three paper clips, then take one of those paper clips. And the hook on the paper clip goes through the loop on the snail's back. This is one of them that you measured. Remember, this is part of the weight that he's able to carry. And you're going to put him down and attach the number of paper clips that were left over from his weight. Remember, if he weighed three paper clips and you're using one to attach to his shell, how many will be hooked on?
Caitlin?

Student: Two.

Teacher: Two.

Student: Go -- get on --

Student: Hook it up.

Student: Our guy will win.

Student: Well, our guy doesn't know where to go.

Student: He needs to kind of go back this way. There.

Student: There he goes; there he goes. See, look. Well, he's trying to move.

Student: There he goes.

Student: He moved a little bit.

Student: You need to put that back on.

Student: It came off.

Student: Maybe if I turn it around this way . . .

Student: That's not going to work.

Student: It may work.

Student: This guy is slow like a tank.

Narrator: The mass can be increased by substituting washers for paper clips.

Student: Three. He's just going like the other ones.

Student: It touches it and then it goes.

Student: I guess when he goes back in, he can't see. So when he pops back out, he doesn't know what's in front of him.

Narrator: When the students weigh the washers, most students are amazed to see that the snails can pull ten times or more their own mass. Reluctant snails can be encouraged with a spray of water. In this class the students got all of the snails going.

Student: He's going over it.

Teacher: As scientists, we have to be very careful about how we treat animals, don't we? Scientists need to think about how they are treating an animal when they are doing the experiments with them. So my question is: Do you think that with the weight that the snails were carrying, do you think that we were harming them? And how would we know that? Caitlin?

Student: Um, I don't think -- we might have -- when we could -- when they were carrying them easily, I don't think that we were harming them. Because if we were harming them, they would be struggling and they would be pulling back. But if they were -- were not and they had an easy load, they probably weren't being -- they probably weren't being harmed.

Like if we carry a box full of books and it's not really heavy, we don't really struggle and it's not really harming us. But if it was a really heavy box of books, we might hurt ourselves carrying it.

Teacher: Uh-huh. Or if we knew a box was way too heavy for us to lift, would we still continue to carry it? No. We would put it down. And the snail would do the same thing. He would go inside of his shell and protect himself and just say "No, I can't pull this."

So do you now think that it's okay to do the snail pull and put some weight on their backs?

Student: I think it's okay if you don't really hurt them. But if you know you're going to hurt them, then I think you shouldn't do it.

Teacher: Okay.

Narrator: The students have conducted a systematic investigation to find out about one behavior of snails, their pulling power. And they've learned more about the structures that allow the snail to move. They've also discussed the animal safety issues related to investigating behaviors of animals.

<Investigation 4, Part 4>

Narrator: In the last part of the module, students choose their own investigations. This allows the students to follow their own interests and gives you insight into how well the students understand the concepts developed in Structures Of Life. This is the time to bring out the Project

Ideas Folder. As much as possible you want the students to use their own ideas and investigate the questions that they have come up with during the module. If you don't have enough ideas in the Project Folder, you can use the Project Ideas sheet to help students think about more investigations.

The project plan sheet should be completed by each student or team of students doing a project. This sheet helps you control the materials and keep tabs on what the students are working on. You'll need to decide whether or not you'll be able to supply any additional equipment when the students ask for it. You'll also want to make sure that the projects the students propose are realistic and will be of some benefit to the class.

FOSS suggests students give three-minute presentations following the guidelines on the Presentation Guidelines sheet. They can also make a poster to help them explain their investigation to the class. Plan about two weeks for the students to complete their projects. Some of the work can be done at school but you'll also want some of it to be done at home.

The Assessment folio has suggestions for scoring the students' work on the projects. Also in that folio, you will find information and masters for two kinds of summative assessment: An end-of-module test given in a variety of formats and suggestions for assembling portfolios.

And that brings us to the end of the module. Keep in mind that there are many details and instructions in the Teacher Guide that we weren't able to cover in this video. So be sure and go over the Teacher Guide very carefully. I hope that you enjoy bringing life into your classroom and sharing it with your students.