

APPENDIX E

SELECTED STUDENT PAGES FROM *FOOD FOR PLANTS*

ACTIVITY THREE: THE SEED AND THE LOG

There are lots of possible questions about plants that we could explore together. Some of you wondered about how trees get so big. How do they get their food to grow so big? How can a tiny pine tree seed grow into a huge tree with a large trunk and many branches? How does it grow those rings? Trees must use food to grow like that. But how does the tree get its food?

Seeds and Tree Trunks

Look at some tree seeds and at a piece of a tree trunk. How does such a tiny seed grow into a huge tree with a trunk and branches and needles (or leaves) and many roots?

What are YOUR ideas (or hypotheses) about how a TINY seed can change into a HUGE tree? Where does all the stuff in the tree trunk come from?

Talk with your partner or group about your ideas. Listen to their ideas.

1. Then write down your ideas about how a tiny seed can become a huge tree:

[S5]

2. Draw a picture showing your ideas about how a tiny seed can become a huge tree:

3. Tell how your ideas are different from someone else in your group?

[S6]

ACTIVITY FOUR:
Our Inquiry: What is food for plants?

In our investigations about plants we will focus on questions about how plants get their food: **What is food for plants?** How do plants get their food? How does their food help plants live and grow? Do they need food in the winter? How can plants use food to change from tiny seeds into large plants (bushes, trees, flowers, grasses, etc.)?

What is food?

In order to understand how plants get their food, you need to understand a scientific meaning of the word “food.” This definition may be very different from what you usually think of as food.

Write down how **YOU** would define **food**. _____

In your definition, is **juice** a food? _____

Is **water** a food? _____

Is **sugar** a food? _____

In everyday life, people have lots of ways of thinking about what food is. When we think of food, we usually think about our own food -- not plants' food. When we think about food for people, some people would say that food is different from drinks. They would say that juice is NOT a food, because you do not chew it. Others

would say that food is anything we “eat”, so juice IS a food because it is taken into our bodies. Still others would say that juice is a food because it is good for us. In everyday life, we can talk about food in these different ways and no one gets confused. We all know that potatoes are food and that stones are not food!

But when scientists explore a question, like *How do plants get their food?*, they need to all SHARE the same definition of food. Scientists have found out that things we take into our bodies do many different things for the body. Water does not do the same thing for your body that meat or sugar or aspirin or vitamins do. Scientists say that these things we “eat” have different functions, or jobs, in the body.

[S7]

So scientists have a special definition for food. Not everything we take into our bodies is food by this definition. In our exploration about how plants get their food, we will use this scientific definition of food:

FOOD is material that living things use for energy to live and grow. All living things must use the energy in food to grow and to keep all their parts working properly.

The most important word in this definition is energy. Energy is what makes all your cells and body parts work. It is what gives your body the power to breathe, to move blood, to move muscles, to repair cuts, to build new cells, and so forth. Each cell in every living thing has lots of work to do to stay alive, and energy is needed to get that work done. All cells of all living things need energy. If your cells do not get energy, you will die.

Living things can **ONLY** get their energy from food. All living things will die if their cells do not get food. Without food they have no energy to continue living.

Look back at your answers to the questions on the previous page. How would you now **CHANGE** your definition of food?

THINKING ABOUT WATER AND ENERGY: A ROLE PLAY

Because juice and sugar supply energy to living things, scientists say that they are both food. Scientists would not say that water is food, because it does not have energy in it that living things can use. Imagine yourself stranded in a place where you have lots of water but nothing else to take into your body. What would happen to you after an hour? How would you feel? How about after a day? Two days? Three days? longer?

[S8]

1. Using our scientific definition of food, explain why you could not live on water alone.

2. People cannot live by eating dirt. Why isn't dirt food for us?

Use the scientific definition of food to explain your answer. _____

1. Draw a picture to show how you think living things get their energy:

[S9]

**ACTIVITY FIVE:
Beginning Ideas About the Question:
What is Food for Plants?**

1. Write down YOUR ideas about how plants get food (put down the ideas you have TODAY; we know that your ideas may change). _____

2. Write down YOUR ideas about what kind of food plants use to live and grow (put down the ideas you have TODAY; we know that your ideas may change).

3. Draw arrows to show how you think food moves in a plant.

Why does it move this way?

_____ [Diagram of a plant]

[S11]

REFLECT AND CONNECT
What is food for plants?
A Scientific Discussion

What this Unit is About

In this unit, we will explore what food is for plants and how plants get their food. We will test our hypotheses to find out how plants get food that contains energy that they can use to live and grow. As we go along, compare what you find out with what you have just written. See how your ideas change and grow.

Getting Started in Our Inquiry: A Scientific Discussion

Now you are going to get together, just like scientists do, and talk about your ideas. When scientists talk, they are not interested in WHO has the right answer, they are interested in working together to come up with the very BEST IDEAS they can. For example, it is not one person who will discover how to keep cancer or the AIDS virus from killing people. Many scientists are working on this problem at the same time. They enjoy getting together to compare their findings and to debate different ideas, or theories about what is causing the disease and how to stop it. They not only enjoy these debates, they NEED these debates. These discussions give them new ideas that they could not have had by themselves. Together we can accomplish much more than any individual scientist alone.

In the movies, do they usually show a scientist working by him or herself in a laboratory? _____ This is our stereotype of scientists, that they work alone.

Have you ever seen a TV show or movie that shows doctors or scientists sitting down around a table and talking about their differing ideas? _____

This part of doing science – talking science together – is just as important as the experiments in the laboratory. Scientists, just like us, need to help each make sense of the things they observe in their experiments.

Now you are going to have a discussion among the scientists in your classroom. Look at the chart on the next page to get some ideas of ways you can be a thoughtful scientist in this discussion.

[S 12]

Do you think the seed is food for plants? Why or why not?

One way to get information about plants' food is by doing experiments with plants. What ideas do you have about how we could do experiments with seeds to find out about how plants get their food?

Read the following description of an experiment with seeds. **As you read this description, think about what clues this experiment might give us about food for plants.**

[S16]

Draw or tell what happened to the seed parts:

[Diagram of experimental set up]

1. Which seed parts grew? _____

2. Which seed parts DID NOT grow? _____

3. Explain why you think some seed parts grew and others did not. _____

4. Where do you think the growing embryo gets its food from? _____

[S20]

Grass Plant Predictions

Predictions

What do you think will happen to the seeds that are in the dark? _____

Explain why you think this will happen.

What do you think will happen to the seeds that are in the light? _____

Explain why you think this will happen.

[S27]

Results of the Grass Experiment

Describe what happened to the grass seeds in the light and in the dark.

LIGHT: _____

DARK: _____

Why do you think this happened?

Explaining The Grass Seed Experiment

A Scientific Discussion

- Does this experiment give us evidence to say whether or not sunlight is food for plants?
- Does this experiment give us evidence to say whether or not water is food for plants?
- Does this experiment give us evidence to say whether or not soil is food for plants?

[S28]

Reflect and Connect: Making Sense of the Grass Experiment

In this experiment the plants left in the dark died, but the plants in the light were green, healthy, and alive.

The plants in the light and the plants in the dark had the same amount of water.

The plants in the light and the dark had the same kind of soil.

BUT the plants in the light lived while the plants in the dark died.

1. Was **WATER** able to help the plants in the dark live and grow? _____

Do you think water provided food for the plants in the dark? _____ Why or why not? Explain your reasoning. _____

2. Was **SOIL** able to help the plants in the dark live and grow? _____

Do you think soil provided food for the plants in the dark? _____ Why or why not? Explain your reasoning.

[S29]

3. Do you think the **SEED** was able to help the plants in the dark live and grow? _____

Do you think the seed provided food for the plants in the dark? _____ Why or why not? Explain your reasoning. _____

4. Explain your ideas about why the plants in the dark died even though they had water and soil.

[S30]

**Reflect and Connect:
Making Sense of the Grass Experiment**

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The plants in the light and the plants in the dark had the same amount of water.

The plants in the light and the dark had the same kind of soil.

BUT the plants in the light lived while the plants in the dark died.

1. Was **WATER** able to help the plants in the dark live and grow? _____

Do you think water provided food for the plants in the dark? _____ Why or why not? Explain your reasoning. _____

2. Was **SOIL** able to help the plants in the dark live and grow? _____

Do you think soil provided food for the plants in the dark? _____ Why or why not? Explain your reasoning.

3. Do you think the **SEED** was able to help the plants in the dark live and grow? _____

Do you think the seed provided food for the plants in the dark? _____ Why or why not? Explain your reasoning. _____

4. Explain your ideas about why the plants in the dark died even though they had water and soil.

[S29]

**ACTIVITY NINE: Dr. Van Helmont
Is Soil Food for Plants?**

How many people in your class think that soil might be food for plants? _____

How many people in your class think that water might be food for plants? _____

What are their reasons?

Traveling Back in Time

We have started doing experiments to find out about how plants get their food. Scientists have been doing experiments for many, many years to find out about food for plants. Aristotle lived years ago, and he thought about plants and how they got their food to grow. In fact, people have probably been wondering about how plants make their food for thousands of years. Even before we called people “scientists”, people were wondering about plants and trying to come up with explanations about how they live and grow. And scientists today are still doing experiments to find out about how plants get their food -- we still do not have all the answers!

Let's travel back in time 350 years. It is now the year 1642. We are in Europe. It is a time of excitement and exploration and travel in this part of the world. Some people have found what they call a New World across the ocean (it is actually a very old world to the Native Americans living in this “New” World)! And more people are getting interested in finding out about the why's of the world around us -- more people are interested in and finding benefactors who will pay them to do science experiments.

We are going to meet one of these early scientists. He is a physician but he also does experiments with plants. His name is Jan Van Helmont. He is from the country of Belgium and the year 1642. He wants to visit with us today. He is going to help us think about our hypothesis that soil is food for plants. He was very interested in that hypothesis. Almost everyone back in 1642 was sure was the soil was the food for plants. Jan Van Helmont decided to prove them right (or wrong?).

[S31]

Is soil food for plants?

[Diagram of a young person eating a large stack of food]

Suppose a child was given 200 pounds of food to eat. Predict what would happen to the weight of that child as he or she gobbled up the food. Does the child's weight go up, go down, or stay the same? Write your answer under the box marked “Weight of Child”:

Weight of Child	Weight of Food

What would happen to the weight of the food on the table as the child ate it? Does the weight of the food go up, go down, or stay the same? Write your prediction under the box marked “Weight of Food”.

[S32]

{Diagram of experimental set up – a small tree in a bucket of soil,
with initial weights of the tree and the soil}

Now think about a young tree planted in a bucket of soil. As the tree grows it gains weight. Does it gain weight from the soil the way a child gains weight from food? Is the soil a kind of food for the plant? What do you think? Write down below whether you think the weight of the soil will go up, go down, or stay the same as the tree grows:

Weight of the Tree	Weight of the Soil

In the 1600's everyone thought that the soil and minerals in the soil were the food for the plants. A scientist named Jan Van Helmont did an experiment to see if this was true. He planted a five pound young tree in a bucket containing 200 pounds of soil. He watered the tree regularly but he did not add any more soil. Look at the picture on the next page and see what happened to the weight of the tree and the weight of the soil after five years.

[S33]

[Diagram of experimental results,
showing the change in weight of the tree and the soil]

Weight gain by tree	Weight loss by soil

The tree gained a whole lot of weight, but the soil did not lose hardly any weight! What do you think Van Helmont concluded? Is soil a food for plants? Why or why not?

Van Helmont decided that soil is NOT a food for plants. The tree did not use any of the soil to grow bigger. In order to grow bigger, the tree (like all living things) needs _____ that is in food.

Think about our scientific definition of food.

Does Van Helmont's experiment give us evidence to say that soil is or is not food for plants? _____

Explain your thinking. _____

[S34]

Are minerals in the soil food for plants?

Everyone says that plants take in minerals from the soil. Minerals do not have very much weight, but they do weigh something. So do you think Dr. Van Helmont's tree took in minerals from the soil? _____

About how much weight did the tree get from the minerals? _____

Do you think this amount of minerals could explain how the tree gained 164 pounds?

_____ Explain your thinking. _____

Think about Van Helmont's experiment. Does that experiment give us any evidence to say whether or not minerals in the soil are food for plants? _____

Explain your thinking.

Is water food for plants?

Van Helmont thought that his experiment was evidence that water must be food for plants. He thought that if soil and minerals in the soil were not giving the tree its food, then the tree must be gaining weight by getting food from the water. After all, he had been watering the tree everyday for five years.

But remember our scientific definition of food. Water helps the tree to grow, but does it give the tree energy? Could the tree live and grow if all it took in was water? Let's think about the evidence from our experiment with the grass plants. It might help us decide whether or not water is energy-giving food for plants.

[S35]

ACTIVITY TEN: Counting Calories-Measuring Food Energy

Is “plant food” you buy at the store and other minerals and fertilizers food for plants?

Van Helmont found that soil is not food for plants. But what about that stuff we put in the soil? Have you ever seen “Plant Food” or fertilizer you can buy at the store to give to your plants? It is called “food”, so is that providing food energy for the plants?

Today we will consider the **hypothesis:**

HYPOTHESIS: Plant food or minerals and fertilizers are food for plants.

EVIDENCE: Can we find any evidence to *support* this hypothesis?
Can we find any **evidence** to *challenge* this hypothesis?

**Are vitamins or minerals food for plants?
Is “plant food” you buy at the store food for plants?**

What do YOU think?

I think minerals and plant food people give to plants ARE or ARE NOT

providing food energy for plants because _____

Measuring Energy in Foods: Calories

Scientists can measure how much food energy is in different foods. They measure how much food energy is in a food by using a unit called a **calorie**. A food with a lot of calories has a lot of food energy in it. Foods with very few calories do not have as much food energy in them. Materials that contain no calories do not contain any food energy. Water is an example of a material that contains no calories. Water does not give you any food energy.

How do scientists find out if there are calories in a substance?:

One way to find out if something has food energy is to burn it. Do not try this at home! If something is a food, then it should burn. Scientists burn various foods and measure how many calories are in them. Then this information can be put on our food containers, so we know how many calories are in the food we are eating.

Watch your teacher try to burn a peanut.

Do you think the peanut will burn? _____

Why? _____

The food energy in the peanut was what burned. The black ashes are the minerals that were in the peanut. If you would have eaten the peanut, those minerals would have become part of your body, and the energy would have been used up or stored as fat.

[S37]

Name _____

Are vitamins or minerals food for plants? Is "plant food" you buy at the store food for plants?

Predictions

1. After our research work today, your teacher will try to burn a sugar-free vitamin pill.

Do you think the vitamin pill will burn? _____

Why? _____

2. Your teacher will also try to burn a plant food stick (minerals).

Do you think the plant food fertilizer stick will burn? _____

Why? _____

How to Explore Labels:

You will look at labels to find out if the materials contain energy as measured by calories. If the material has calories, then you know it is an energy-providing food. If the material does not contain calories, then it is not an energy-providing food.

Each label will tell you the ingredients that are in the package. It will list the different ingredients, the vitamins, the minerals, and the calories (if there are any).

Look at the calorie content of different materials to find out if they have any food energy in them. Also look to see if the substance contains any kind of sugar (glucose, fructose, sucrose), because sugar is energy-containing material.

Examine as many items as you have time for.

Write your results on the chart:

[S38]

Name _____

**REFLECT AND CONNECT:
Are minerals and fertilizers food for plants?**

Look at Your Chart...

1. Which items on your chart are NOT food by the scientific definition?

2. Do you predict that the vitamin pill will burn? _____

Watch what happens when your teacher burns the vitamin pill.

How do you explain the results? _____

3. Do you predict the “plant food” sticks will burn? _____

Watch what happens when your teacher burns the plant food sticks.

How do you explain the results? _____

4. Write on a yellow post-it your evidence to support or challenge the hypothesis that minerals and plant food are food for plants. Put your post-it in the appropriate column on your class data chart.

1. Draw a picture of something you learned today:

[S40]

**REFLECT AND CONNECT:
The Grass Experiment
and Von Helmont's Experiment
and Our Food Analysis Project**

- What observations did Van Helmont make in his experiment back in 1642?
- What observations did you make of the grass plants in the light and the dark?
- What observations did you make about plant “food” and minerals from your study of their energy calories?

Let's try to put these three experiments together and see what we can figure out about how plants get their food.

When the grass seeds first began to grow, they used food stored in the _____ for their energy. As the plants got bigger, the food in the cotyledons was all used up. Now what could the grass plants use for food energy?

Could they use soil? We know from Von Helmont's experiment that soil is not food for plants. It did not get used by Von Helmont's tree as it grew. Soil does not supply food energy for plants.

Could the grass plants use minerals in the soil for food energy? We know from our calorie experiment that plant foods and minerals do not contain any calories, so we know they do not provide living things with any food energy. So the grass plants could not get energy from the minerals or fertilizers in the soil.

Could the grass plants use water for food? In the grass plant experiment the grass in the light and the grass in the dark had the same soil and the same amount of water. Both had soil and water, but the plants in the light lived and the plants in the dark died. The plants in the dark died even though they had water. Also, our calorie count showed that water has no calories -- no food energy. So water could not be food for plants.

Just like people, plants cannot use water for energy. You would starve to death if you only drank water and ate no food. You would not be getting any food energy because water does not have any food energy. Plants starve to death, too, if they do not get their food. And water by itself is not food for plants.

[S41]

The reason the plants in the dark died is that they did not have food to give them energy to continue living and growing. The soil and the water were not enough. The plants in the dark had water and soil, but they had no food for energy. They died from lack of food.

WHAT DO YOU THINK?

Are you convinced that **water** is not food for plants? Why or why not? _____

Are you convinced that **soil** is not food for plants? Why or why not? _____

Are you convinced that **minerals** in the soil is not food for plants? Why or why not?

[S42]

**REFLECT AND CONNECT:
Using the Idea of Photosynthesis?**

1. Read again your beginning ideas about how plants get their food.
Do your beginning ideas say the same thing that you just read about?
How were your ideas different from what you just read about?
Now try using the idea of photosynthesis to explain how plants get their food:

2. Think about our grass plant experiment. Now try using the idea of plants making their own food to explain why the plants lived in the light but died in the dark.

3. Read a description of photosynthesis from another book.
Tell one new idea you got about photosynthesis from reading this explanation.

Of the two explanations you read, which one makes more sense to you? Why?

4. Use the idea of photosynthesis to explain why the soil in Van Helmont's bucket did not change even though the tree gained 164 pounds. How did the tree gain all that weight?

[S46]

Photosynthesis and our Bean Experiment

We just said that plants can only get their food by making it themselves. But you may remember another way we thought that plants can get food. We said that young plants (embryos) can get food from their cotyledons (seeds). Isn't that a different way that plants can get food? No, not really! How do you think the food got into the seed?

The food in the seed did not come from the soil or the water or the air. The food in the seed's cotyledon was MADE by the parent plant by combining water and air using sun energy. The parent plant can make more food than it needs. Some of the extra food is stored in the seed. So when the seed falls off the parent plant, it has some food ready for the new embryo (baby plant).

REFLECT AND CONNECT: Putting Together Two Big Words -- The Cotyledon and Photosynthesis

[cartoon showing a parent plant packing
a lunch in the seed for the young embryo]

2. What story does this cartoon tell about how plants get their food?
3. Explain why the seed needs food in the cotyledon to start growing. Why can't the embryo in the seed just make its own food?

Did that question stump you? If so, think about the three things a plants needs to make food. Does the seed in the soil have all three of these things?

[S47]

The Amazing Leaf's Secret

The green leaf is the only thing in the world that can make food out of air and water. Scientists have tried to discover and copy the leaf's secret. They have tried to make food in a laboratory using water and air and light. But the leaf is very complicated. People have not been able to steal the leaf's secret. People have built bakeries that can take food made by the plant (like wheat) and CHANGE it into many different, fancy kinds of food – bread, doughnuts, chocolate chip cookies. But no human bakery can make food out of carbon dioxide and water! We have not found out the secret of how to take sunlight energy and change it into food energy. ONLY the plants have the secret. Without plants, there would be no food in the world.

Check your Understanding

What things go into the leaf?	Can it provide energy to living things (in its current form)?	Is it food for the plant?	Is it needed to make food?

What is made by the leaf?	Can it provide energy to living things (in its current form)?	Is it food for the plant?	Is it needed by the plant to grow?

[S48]

Putting it Altogether – Food for Plants

We have seen that food for plants that has energy in it does not come from the soil, or from the water, or from fertilizer, or from minerals. Plants do not take in food from their environment.

Instead, plants have an amazing ability to use energy from the sun to change water and air into food energy. As long as plants have light, air, and water, they can make their own food inside their leaves. This

complicated way of making food is called photosynthesis. If plants do not have light, they cannot make food and will die of starvation. They cannot make food in the dark. They can only get food by making it in their leaves in the light.

Now try using these ideas to explain the following situations:

2. When a plant is dry and wilted, what do you do to help it? _____
3. Does this mean that the water is food for the plant? _____ Explain:
4. Cows make milk that we drink. And milk contains food energy that we can use to live and grow. But we said that only plants can make food!

Can a cow make food out of air and water like plants? _____

Where does the cow get the food energy it needs to make milk? _____

The first step in making milk is for cows to eat plants!

[S49]

ACTIVITY TWELVE: Bean Plant Photographs

Look at the photographs of bean plants at different stages of growth in the book your teacher gives you. The book was written by Christine Back and photographed by Barrie Watts. It is called Bean and Plant.

Work with a partner. Look at each photograph and come to an agreement about how the bean is getting its food in that photograph. Be ready to explain your thinking to the class.

[S50]

ACTIVITY SEVENTEEN
Creating Models and Concept Maps to Show How Plants Get Their Food

Scientists often create **models** to show others about their ideas and theories. You already know about models. You probably have played with toys that are models of things in the real world. For example, you may have played with a doll which is a model of a baby, or you may have played with model cars. Maybe you have even built models of rockets or airplanes or houses. Sometimes our models are 3-dimensional but models can also be pictures, drawings, or maps. Have you ever drawn a picture or map of your house or your bedroom? This was a kind of a model of your house or your bedroom. You could show the picture to someone who had never seen your room and they would have some idea what your room was like. Of course, they would not understand exactly what your room was like because a model can never be exactly like the real thing.

With your group members you are going to create two kinds of models to show what you have learned about food for plants.

I. A Skit Model. Using simple props and materials that your teacher shows you, work with your group members to act out how a bean embryo grows and gets its food.

In what ways was your skit an accurate model of how a bean grows and gets its food?

In what ways was your skit **NOT** an accurate model?

II. A Concept Map (or Word Picture) .

Using the words provided to you by your teacher and/or classmates, work with your group members to construct a word picture that explains how plants get their food. You can use arrows and simple drawings, but your map should focus on the concept words.

[S65]

**ACTIVITY NINETEEN:
More Opportunities to Apply the Ideas**

Comparing Food for Humans and Food for Plants

We said that both plants and humans need food because it gives them the energy they need to grow and to keep all their parts working and living. Both plants and humans need food for the same reason – to get energy to live and grow. Now that we have studied how plants get their food, it is clear that plants get their food very differently from humans. See how many of these differences you can describe:

	How many sources of food do they have?	What is their food?	Where do they get their food?	How do they get their food?	When can they get/make their food?
<u>HUMANS</u>					
<u>PLANTS</u>					

[S67]

Using Your Knowledge About Food For Plants—

Puzzles and Problems to Think About

THE CAVE PROBLEM

[Drawing of a bat flying into a cave and dropping seeds]

Some large and small seeds got stuck in the fur of a bat. The bat flew in a damp, dark cave. The seeds fell out of the bat's fur and onto the damp soil. There was no light but plenty of water in the cave. What do you predict will happen to the seeds?

[S68]

THE WINTER PROBLEM

Trees with needles usually keep their needles even in places where the winter is very cold. Other kinds of trees lose their leaves when it is very cold. How do you think both kinds of trees survive and get their food in the winter?

How does a pine tree get its food to survive in the winter?

How does an oak tree get its food to survive the winter?

THE NIGHT PROBLEM

How do plants get their food at night time when it is dark out? Or do you think they just don't eat at night? Explain your reasoning.

[S69]

THE POND IN WINTER PROBLEM

A pond freezes in the winter and then it gets covered with snow. There are fish and plants that live in the pond.

What do you think will happen to them in the winter when the snow is covering the pond?

[S70]

THE AMARYLLIS PROBLEM

Some plants grow from bulbs. The amaryllis is one of these kinds of plants. The bulb is like a seed. It has stored food for the plant to begin to grow.

Jonathan weighed an amaryllis bulb. He weighed some soil. And he weighed a pot.

He then planted the amaryllis bulb in the soil in the pot.

He watered the amaryllis bulb regularly and kept it in a warm room.

What do you predict will happen to the amaryllis bulb? _____

What do you predict will happen to the weight of the amaryllis bulb after a month?

What do you predict will happen to the weight of the soil after a month?

What are your reasons for your predictions?

[S71]

THE SUGAR TREE PROBLEM

In the Ojibway language of the Anishinabe people, an old story is told of Ininatig, “the man tree.”

It was the end of a long, cold winter, and a family was starving. The hunting had not been good that year, and all the stored food had been eaten. As the family looked out at the lake near their camp, they noticed that the ice was changing from white to black. This meant that the ice was thin and that Spring was coming. They would find food then, if only they could stay alive that long.

Behind them, the family heard the trees creaking in the wind. Above the noise of the trees, the father thought he heard someone speak. He turned but saw no one. He thought he must be hearing things.

Then the mother heard a noise. She asked her husband, “Did you say something?”
“No, I didn't,” he said.

They both turned when they heard someone say, “I will teach you a way to get food so that you will never have to starve.” The whole family was frightened. Trees don't talk to human beings! Yet, it was true. They had all heard it. Ininatig -- the man tree -- had spoken.

He told the family to cut his skin, not too deep, but just enough. He told them to collect the liquid that flowed from the cut. It would be clear as water and cold and just a little sweet. He told them to boil the liquid until it became a dark, thick, sweet syrup. They could eat this food, or they could boil it more until it became even thicker. If they poured this thick syrup into a trough and stirred it back and forth, it would turn into sugar.

The family did exactly as they were taught. They had enough food to keep them strong until the ice on the lake broke and there would be fish. The man tree had saved their lives.

Now every spring the people hold a thanksgiving for the trees.

What do you think the liquid was in the tree? _____

How do you think the sugar got inside the liquid in the tree? _____

This story was taken from Ininatig's Gift of Sugar: Traditional Native Sugarmaking by Laura Waterman Wittstock

[S72]

ACTIVITY 20
REFLECT AND CONNECT
Revisiting Your Initial Ideas

Look back at what you said about food for plants at the beginning of this unit (p.).

1. How would you now describe how plants get their food?

2. How would you now use arrows to show how food travels in a plant?

Explain your arrows:

[Diagram of a plant]

[S73]

3. Describe how your ideas about food for plants have changed:

Before I thought that plants got their food _____

But I changed my mind about _____

I changed my mind because _____

4. I thought the best evidence we got about how plants get their food was

[S74]